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RECORD OF DECISION
TONOLLI CORPORATION SUPERFUND SITE

DECLARATION

SITE NAME AND LOCATION

Tonolli Corporation Superfund Site
Nesquehoning Borough, Carbon County, Pennsylvania

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Tonolli Corporation Superfund Site ("the Site"), located in Nesquehoning Borough, Carbon County, Pennsylvania. The remedial action was developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for this Site.

The Commonwealth of Pennsylvania has not concurred on this remedy.

ASSESSMENT OF THE SITE

Pursuant to duly delegated authority, I hereby determine pursuant to Section 106 of CERCLA, 42 U.S.C. Section 9606, that actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to the public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The remedial action selected for the Site is a <u>final</u> remedy, and will address all sources of contamination present in soils, battery wastes, the onsite landfill and surface water so that the Site can be used in an industrial manner. This action will restore the ground water to its beneficial use by cleaning the overburden aquifer to background levels and preventing migration of contaminants to the bedrock aquifer by using gradient controls.

The selected remedy includes the following major components:

1) Offsite transport and treatment of approximately 13,000 cubic yards of battery wastes, including battery casings, iron oxide, sump sediments, and dust by resource recovery at a secondary lead smelter. Additional sampling and

characterization of other waste pile materials (i.e., crusher building dusts) will be conducted to confirm whether these materials can also be treated effectively via this process. Similarly, excavation of all sediments and battery fragments in stormwater collection piping and onsite sumps will be completed, and these materials will be characterized to determine whether they can be processed via resource recovery or consolidated within the onsite landfill.

2) Excavation of all soils with lead contamination above 1,000 mg/kg (approximately 39,000 cubic yards), and backfill and grading for excavated onsite areas. Consolidation of all soils with lead contamination ranging from 1,000 mg/kg to 10,000 mg/kg within the onsite landfill. Onsite stabilization of all soils posing a principal threat with lead contamination above 10,000 mg/kg (approximately 7,300 cubic yards), and consolidation of treated soils into the onsite landfill. Excavation of soils situated in the residential area to the immediate west of the property boundary containing greater than 500 mg/kg lead, collection of confirmatory samples, and consolidation of soils into the onsite landfill, and backfilling of the area with clean soil. Additional sampling will be completed prior to excavation to define the area and volume of soils potentially impacted by the Site activities and requiring remediation.

3) Consolidation and, if necessary, treatment of approximately 2,020 cubic yards of treated sludges, approximately 250 drums of melted plastic, and approximately 210 cubic yards of excavated lagoon soils into the onsite landfill prior to closure. Additional sampling will determine whether the lagoon soils and drums can be consolidated in the onsite landfill.

4) Additional sampling and completion of bioassays for contaminated sediments in Bear and Nesquehoning Creeks will be completed during the remedial design phase to develop appropriate cleanup levels for this medium. Once an appropriate cleanup level for sediments has been approved by EPA in consultation with PADER, all sediments above the approved cleanup level will be excavated from the creek(s) and consolidated within the onsite landfill.

5) Closure of the onsite landfill in accordance with the federally authorized Pennsylvania requirements for hazardous waste, including: removal of standing water from the landfill, upgrade of the leachate collection system, consolidation of materials generated during the remedial action within the landfill to meet the minimum grading requirements, application of a properly designed layer of agricultural limestone, and cover of the landfill with a cap having a permeability of less than 1×10^{-7} cm/sec. The addition of a layer of crushed or pulverized limestone shall

be designed to prevent potential future leaching of lead from the consolidated soils to the onsite landfill. A treatability study will be completed to evaluate the optimal application rate of agricultural limestone to provide the maximum pH buffering capacity to the consolidated soils for this <u>in-situ</u> passive treatment method. Post-closure care of the landfill will include maintenance of the cap and dewatering system, and construction and routine sampling of a ground water monitoring network for a 30-year period.

6) Approximately 2 million gallons of landfill leachate (standing water), decontamination fluids generated during remediation, and approximately 16 million gallons per year of contaminated stormwater will be collected and treated using the existing onsite treatment system prior to discharge to Nesquehoning Creek. Monitoring data collected from the treatment system will be used by EPA in consultation with the State to determine appropriate discharge levels in compliance with the substantive requirements of the NPDES program.

7) Treatment of contaminated overburden ground water by construction of a vertical chemical barrier (i.e., limestone trench) with possible injection of pH adjusted water to enhance ground water flow rates. Gradient controls will be used to prevent infiltration of contaminants into the bedrock aquifer. Monitoring of the effectiveness of the vertical chemical barrier and/or injection of pH adjusted fluids, and monitoring of the bedrock aquifer beneath the Site will be completed.

8) Decontamination of Site buildings by either vacuuming or washing, including dismantling of non-structural components and removal of equipment and debris that may inhibit thorough decontamination.

9) Offsite disposal of drained nickel/iron batteries.

10) Maintenance of Site fence and Site security, as needed, to limit trespassing and access to the Site during construction.

11) Air monitoring during onsite activity.

12) During the course of the remedial action, and the excavation and construction phase, measures will be taken to prevent runoff of surface waters, sediments, and/or contaminated soils or battery wastes from entering Nesquehoning or Bear Creeks.

13) Evaluation of the onsite underground storage tanks will be completed during remedial design. Any tanks that may impede the completion of the selected remedy, specifically the excavation of contaminated soils, will be addressed

during remediation.

14) Institutional controls, in the form of deed restrictions will be placed on the deeds to the parcel(s) that comprise the onsite landfill to limit the use of this land and prevent excavation or construction on the capped and closed landfill. Additional deed restrictions will be implemented to limit the use of the Site to industrial use only.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this remedy will result in hazardous substances remaining onsite above health-based levels, a review by EPA will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Edwin B. Erickson
Regional Administrator
Region III

9/30/92
Date

RECORD OF DECISION
TONOLLI CORPORATION SUPERFUND SITE
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THE DECISION SUMMARY

I. SITE NAME, LOCATION, AND DESCRIPTION

The Tonolli Corporation Site (Site) is located in the Green Acres-West Industrial Park on the north side of State Route 54 in Nesquehoning Borough, Carbon County, Pennsylvania. The Site covers approximately 30 acres, and is situated three miles west of the Borough's business district and approximately 25 miles northwest of Allentown, Pennsylvania (Figure 1).

The Site is situated within the Nesquehoning stream valley bounded by Broad Mountain to the north and Nesquehoning Mountain to the south. The Site is bordered by Nesquehoning Creek which flows west to east approximately 50 feet south of the Site, and Bear Creek which flows south from a reservoir along the western boundary of the Site. The topography surrounding the Site is mixed mountain/valley terrain with much of the area consisting of mine spoil and coal refuse.

Major communities within a three-mile radius of the Site, in addition to Nesquehoning, include three communities south of Nesquehoning Mountain: Summit Hill Borough, Lansford Borough, and Coaldale. Smaller communities within one mile of the Site include Hauto, the Lake Hauto development, and Hauto Valley Estates. Approximately 17,000 people live within the three-mile radius of the Site, including 20 residences which are located within one-quarter mile of the facility.

The Site consisted of a battery receiving and storage area, battery crushing operation, smelter, refinery, wastewater treatment plant, an above-ground 500,000 gallon wastewater storage tank, a 500,000 gallon butyl rubber-lined waste lagoon, and a 10-acre butyl rubber-lined solid waste landfill. Existing Site structures include a battery crushing building, a refinery building, air treatment units, a wastewater treatment plant, an above-ground 500,000 gallon storage tank, and a 10-acre landfill. The Site is protected with an eight foot high security fence with three locked gates.

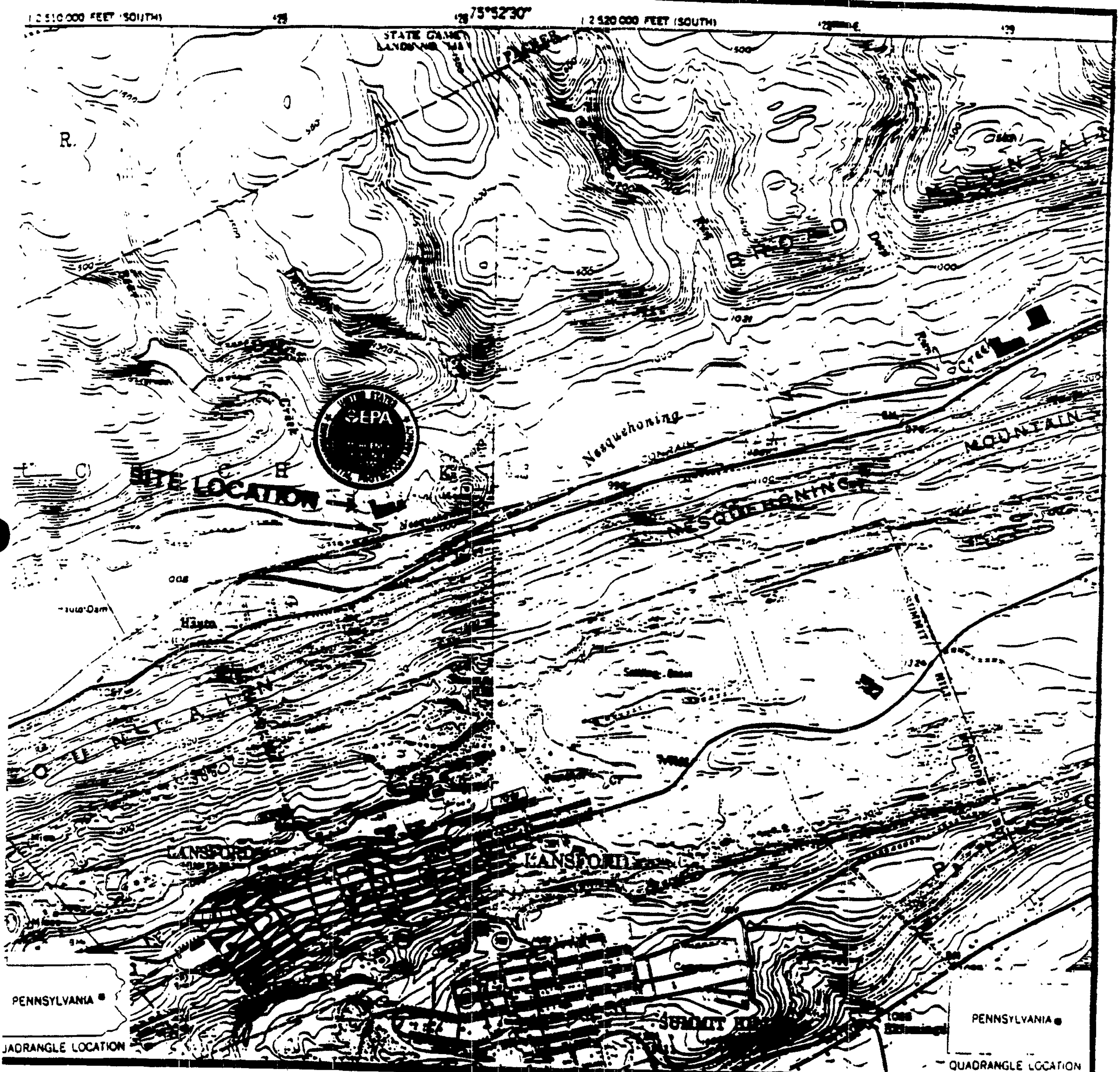
II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

A. BACKGROUND

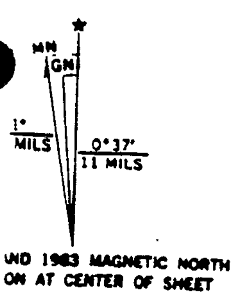
The Tonolli Corporation ("Tonolli") operated a battery recycling and secondary lead smelting plant at the Site from August 1974 until operations terminated in January 1986. The operation at the Site included the storage, breaking, processing and smelting of used batteries, battery components, and other lead-bearing materials.

FIGURE 1

SITE LOCATION MAP



* SOURCE: NESQUEHONING & TAMAQUA QUADS



TONOLLI CORPORATION SITE
NESQUEHONING, CARBON COUNTY, PA

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Spent batteries were brought in to the Site by truck, weighed, and driven to an outdoor paved receiving area. In this area, the batteries were broken, then piled on both sides of the receiving area to allow the acid to drain into a sump. The acid flowed from the sump through underground piping to a treatment plant for neutralization. Broken batteries were transferred to the hopper of a hammermill crusher, and the resulting crushed pieces were moved by conveyer belt to a rotary breaking/drying drum which separated the battery pieces using water. The metal and plastics were separated from the rubber-based Bakelite casing materials by flotation. Lead materials were conveyed to a storage/mixing room, plastic was transported by truck to an onsite plastics storage pile, and the bakelite (hard rubber) was transferred to the onsite landfill.

The solid and aqueous byproducts generated during operations at the Site consisted of four primary streams: 1) slag from the secondary lead smelting process; 2) calcium sulfate sludge from air pollution control scrubbers; 3) plastic battery casings and bakelite chips; and, 4) excess process water, battery acid, and stormwater runoff. Spent lead acid batteries and other lead containing materials that were recycled through the furnaces to recover the lead resulted in the production of slag. The slag was cooled and disposed of in the onsite landfill. Calcium sulfate sludge generated from the scrubber system was pumped to the landfill through an above-ground pipe system. Excess process water, battery acid and rainwater that passed through the plant area were directed by underground piping to the settling tank and wastewater lagoon. The water was neutralized and then recirculated back into the lime slurry air scrubbers.

During periods of high precipitation, the lagoon was incapable of holding the runoff, and thus the excess water was pumped to the landfill for temporary storage. When the level in the lagoon was sufficiently reduced, the water was pumped back through the treatment system. In 1985, a 500,000-gallon tank was constructed to handle the lagoon overflow. In addition, the Tonolli Corporation excavated a trench adjacent to the wastewater lagoon to assist in alleviating the overflow of the lagoon. The trench was connected to a drainage ditch that allowed the lagoon overflow to discharge directly to Nesquehoning Creek.

In late 1979 and early 1980, Tonolli became subject to the requirements of the Resource Conservation and Recovery Act ("RCRA"), 42 U.S.C. Section 6901, <u>et seq</u>. On August 7, 1980, pursuant to Section 3010 of RCRA, the Tonolli Corporation notified EPA of hazardous waste activity at the Site. On November 18, 1980 Tonolli submitted a RCRA Part A ("Part A") application to EPA indicating the types and characteristics of the hazardous wastes generated and otherwise handled on the Site, and qualified for interim status under Sections 3004 and 3005 of RCRA. In 1985 Tonolli Corporation amended its Part A to include sludges, crushed battery casings, and storage of corrosive and heavy metal-bearing wastes in an above-ground storage tank. The hazardous wastes handled on the Site included emission control dusts (K069), solids and liquid wastes containing arsenic (D004), cadmium (D006), chromium (D007), and lead (D008).

A number of sampling programs were conducted at the Site under the supervision of Tonolli Corporation, EPA Region III, and/or PADER between 1974 and 1989. Soil samples collected by PADER in 1982 and EPA in 1984 showed elevated levels of lead and cadmium in several onsite areas. Additional samples collected by EPA between 1987 and 1989 showed elevated levels of arsenic, cadmium, chromium, copper and lead in onsite soils near waste disposal areas. Surface water sampling completed between 1983 and 1989 for both onsite areas and the Nesquehoning Creek showed elevated levels of arsenic, cadmium, and lead. Groundwater sampling activities completed between 1976 and 1989 showed elevated levels of arsenic, cadmium, copper and lead in onsite monitoring wells. Air sampling completed by Tonolli from 1974 until 1985 showed that the National Ambient Air Quality Standard for lead was exceeded on several occasions during this time frame.

After Tonolli filed for bankruptcy in late 1985 and thereafter abandoned the Site, PADER inspected the Site, and found that an illegal diversion ditch had been created to allow direct discharge of contaminated surface water runoff to Nesquehoning Creek in order to prevent an overflow of the onsite waste lagoon. PADER issued a Notice of Violation to Tonolli and assessed a civil penalty. PADER continued to monitor the Site conditions, and in late 1986 requested EPA to consider taking interim response actions to address the contaminants and waste disposal areas remaining at the facility.

B. REMOVAL ACTION

Between February and August of 1987, EPA completed three Site assessment and sampling activities. High concentrations of lead, cadmium, chromium, arsenic and copper were detected in both on and offsite soils, groundwater and surface water. Samples from the Nesquehoning Creek showed increased levels of heavy metals and sulphates, and decreased pH in downstream areas. The 500,000-gallon storage tank was found to contain extremely acidic wastewater with arsenic, cadmium, and lead. In addition, a break in the Site's perimeter fence was found, thus allowing access to contaminated onsite areas.

EPA's Emergency Response Program completed stabilization activities at the Site between May and December 1989. The scope of work included the pumping and onsite treatment of lagoon wastewater, pumping and offsite disposal of wastewaters in the above-ground storage tank, excavation and stabilization of lagoon sludges, removal of the lagoon liner, excavation of soils beneath the lagoon, backfill and grading of the lagoon and illegal diversion ditch, and repair of the Site's perimeter fence. A mobile onsite treatment system was installed to provide treatment and filtration of heavy metal-contaminated surface water that continues to flow across the Site after rain events. In addition, Site security was provided through contracting with a local guard service.

C. INCLUSION ON THE NATIONAL PRIORITIES LIST

The Tonolli Site was scored using the Hazard Ranking System (HRS) in 1987 by EPA. The Site was given an HRS score of 46.58, based on pathway scores for groundwater, surface water and air. The Site was proposed for inclusion on the National Priorities List (NPL) in June of 1988, and was promulgated on the NPL on October 4, 1989.

D. HISTORY OF CERCLA ENFORCEMENT ACTIVITIES

Between 1987 and 1988, EPA identified and notified several hundred potentially responsible parties ("PRPs") for the Site conditions. Based upon review of Tonolli's documentation of the pounds of scrap batteries generated and transported to the Site for processing and/or disposal, and responses to requests for information from several companies who sent scrap batteries to the Site, EPA developed a list of 391 PRPs. Following the proposal of the Site on the NPL, EPA issued General Notice letters to the PRPs in August 1988, requesting them to conduct or fund a Removal Action and/or Remedial activities. On September 19, 1989, 46 PRPs entered into an Administrative Consent Order with EPA for the conduct of a Remedial Investigation and Feasibility Study ("RI/FS").

On December 17, 1991, EPA issued a Unilateral Administrative Order for Removal Action pursuant to Section 106(a) of CERCLA, 42 U.S.C. Section 9606(a), to the 46 PRPs who performed the RI/FS for the Site. This Order required the PRPs to operate and maintain an automated onsite water treatment plant to address the contaminated surface water that continues to flow across the Site during precipitation events.

EPA continued to develop information on the PRPs associated with the Site, and the documents collected from Tonolli's offices during the course of the RI/FS. Upon identifying additional parties who generated, transported and/or arranged for the treatment or disposal of scrap batteries, EPA continued to issue General Notice letters and encourage PRP participation in the response actions. As a result of this work, a total of 528 PRPs were identified for the Tonolli Site.

Using the documents collected from the Tonolli Site offices, EPA developed a Waste-In List or Volumetric Ranking Summary which specified the volume of waste contributed to the Tonolli Site by individual PRPs. EPA developed this list as a settlement tool to identify those PRPs who would qualify as de minimis parties under CERCLA Section 122(g). Between January and August of 1992, EPA completed activities associated with an early de minimis waste contributor settlement, as authorized under Section 122(g) of CERCLA. In July 1992, a de minimis settlement was reached between EPA Region III and 170 Tonolli Site PRPs. This settlement is embodied in an Administrative Consent Order, pursuant to which the settling PRPs agreed to pay approximately $3,491,233 toward EPA's past response costs incurred at the Site, and the future costs associated with the required remedial action.

E. HIGHLIGHTS OF COMMUNITY PARTICIPATION

The public participation requirements of Sections 113(k)(2)(B)(i-v) and 117 of CERCLA have been met in this remedy selection process. A newspaper advertisement was published in the Times News, Lehighton, Pennsylvania, on Saturday, July 18, 1992. It specified the availability of the Proposed Remedial Action Plan (PRAP), the duration of the public comment period, and the location of the Administrative Record file.

The public comment period began on July 18, 1992, and was scheduled to end on August 18, 1992. EPA received a timely request for an extension of the comment period, and thus granted the minimum 30-day extension, in accordance with the provisions of the NCP. A newspaper advertisement was published in the Times News, Lehighton, Pennsylvania, on August 17, 1992, notifying the public of the extension of the comment period to September 18, 1992.

A public meeting was conducted on July 28, 1992, at the Nesquehoning Borough Recreation Center. Approximately 40 people attended, including former Tonolli employees, residents from the Site area, members of the Borough Council, representatives of the local water authority, and staff from EPA Region III and PADER.

III. SCOPE AND ROLE OF RESPONSE ACTION

This Record of Decision (ROD) selects a Remedial Action for all contaminated media present at and around the Site, including the battery waste piles, contaminated surface and subsurface soils and sediments, onsite buildings and structures, the onsite landfill, and contaminated surface water and groundwater. This action will address all sources of contamination present at the Site, as well as all areas that are or may be impacted by the contamination. Principal threats and lower level threats posed by the Site conditions will be addressed by the remedial action selected in this ROD.

The primary objectives of the remedy are to prevent exposure to the battery waste piles, contaminated soils and groundwater, to minimize the migration of contamination from the Site via wind and surface water transport, to reduce contamination in the shallow alluvial aquifer, and to protect the bedrock aquifer from migration of contaminants through the subsurface. The remedy selected by EPA is consistent with the removal action implemented at the Site in 1989.

Lead poses the greatest threat at the Site. EPA is adopting a cleanup level for lead in onsite soils of 1000 mg/kg. Under this cleanup level, the future use of the Site will be restricted to industrial use, for which it is currently zoned. Present EPA policy is to use a range of 500 - 1000 mg/kg in residential areas to protect the health of young children, as supported by the Integrated Uptake/Biokinetic Model. There are currently no recognized methods for evaluating lead exposure in adults. Without such a method, the criterion for a soil lead level that will be protective of adults who work, but do not live, on an industrial site has not been established. EPA has, therefore used best available information to choose 1000 mg/kg, the upper bound of the "residential" range, as a reasonable cleanup level to protect the health of adult onsite workers.

EPA believes and expects that a cleanup level of 1000 mg/kg would ensure that the average soil lead level remaining onsite would be lower than 1000 mg/kg, and thus would not impact the environment, e.g., leach to the groundwater. The RI/FS data shows that elevated levels of lead in groundwater were only detected in monitoring wells situated downgradient from the major process areas (battery breaking, storage, smelting) at the Site. EPA believes that this lead was introduced into the groundwater through its dissolution in the low pH conditions associated with battery acid and stormwater containing battery acid. Elevated levels of lead were not detected in groundwater in Site soils contaminated with lead, and that were upgradient of the major process areas. This data indicates that lead levels in soil, far greater than the 1000 ppm cleanup level, have not impacted groundwater in most of the Site area. Based on this data, EPA believes that the soil cleanup level of 1000 ppm for lead will be protective of groundwater.

Specific objectives for the cleanup of the Site are to:

1. Prevent exposure (inhalation, ingestion) to onsite waste piles (byproduct materials, dust, contaminated buildings) and soils having a lead concentration greater than 1,000 mg/kg.

2. Prevent direct contact with battery casing piles and sump sediments having lead concentrations greater than 1,000 mg/kg.

3. Prevent direct contact with landfill contents and reduce the potential for leachate leakage.

4. Prevent exposure of residents to soils situated to the immediate west of the Tonolli property boundary having a lead concentration greater than 500 mg/kg.

5. Reduce concentrations of contaminants present in the overburden aquifer to background levels and prevent the migration of contaminants to the bedrock aquifer.

6. Prevent migration of contaminated stormwater to offsite areas, specifically Nesquehoning Creek, in excess of discharge limits established under the NPDES program.

7. Prevent migration of contaminants that would result in sediment contamination in excess of cleanup levels for lead, arsenic, and cadmium, copper and zinc. Appropriate cleanup levels must be determined by the conduct of sediment bioassays.

8. Prevent exposure to surface water, groundwater, runoff and leachate containing Site contaminants above health-based levels.

IV. SUMMARY OF SITE CHARACTERISTICS

A. BACKGROUND

The Tonolli Site is situated in a sparsely populated area, with approximately 20 residences located within one-quarter mile of the Site. Prior to Tonolli's activities, the Site area was used for disposal of coal mine spoil and ash from a coal-fired power plant that was situated approximately 1.1 miles west of the Site. The Site area is zoned for industrial use, and is part of the Green Acres Industrial Park West. Other industries in the Site area include a company that manufactures residential house siding, a coal company and its stockpiles, and a company that blends plastics.

Within three miles of the Site the land use is mostly rural undeveloped, with pockets of low-density residential and industrial development. Much of the area is forested, with one reservoir (Lake Hauto) located about one mile upstream on Nesquehoning Creek, and a second reservoir located a similar distance upstream on Bear Creek. There are no significant agricultural lands in the Site vicinity, and according to the Pennsylvania Game Commission there are no state gamelands, wildlife refuges, wilderness areas, state parks, or state recreational areas in the Site vicinity. Lake Hauto is used for recreational fishing and boating.

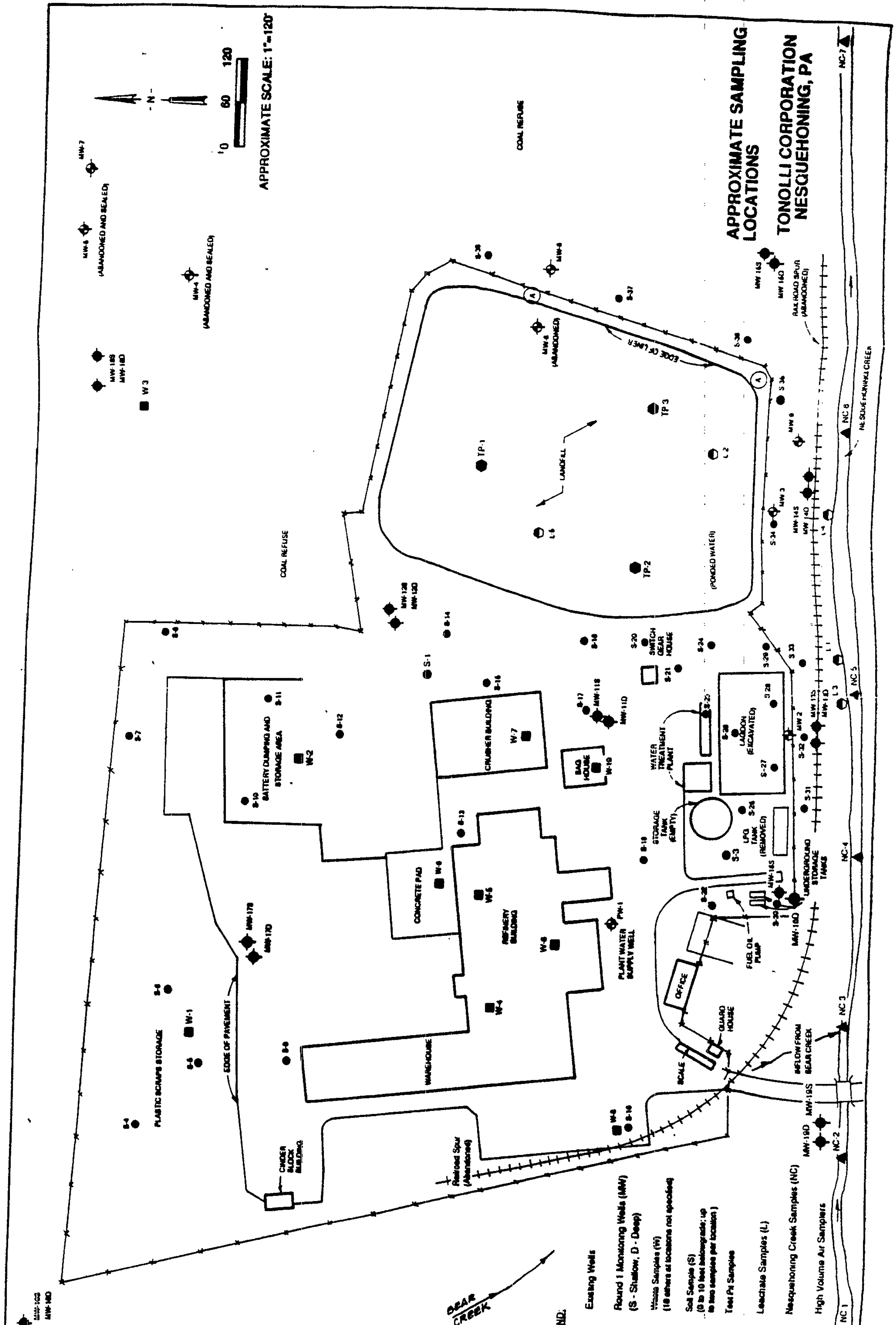
Dominant surface features in the Tonolli Site area include the large quantities of mine spoil that are piled on the land surface. The mine spoil includes coal refuse, mine spoil overburden and ash, and is located on the south, north and east sides of the Site property line. These piles are also locally referred to as culm banks. The area in which the Site was constructed was covered by mine spoil prior to the construction of the Tonolli facility. This mine spoil is reportedly from the Bethlehem Mines Site, Greenwood Colliery, and was brought into the Nesquehoning Valley between 1920 and 1940 for cleaning through a valley floor railway tunnel near Hauto.

The majority of the Site property is flat, sloping from the northwest corner to the southeast corner in the area of the old lagoon. Most of the ground surrounding the Site buildings is covered with asphalt. One large pile of battery casings remains in the northern area of the Site, and smaller piles remain in the battery dumping and storage area. The eastern portion of the Site is dominated by the existing landfill, which contains a large portion of the byproducts generated during Tonolli's operation. In addition, a large depression exists to the north of the landfill where mine spoil appears to have been excavated to begin construction of a new landfill cell at the Site. This area and the truck garage area are the only parcels of the Tonolli Site that are not enclosed by the fence.

The field work for the Remedial Investigation/Feasibility Study (RI/FS) was completed in two major phases between July 1990 and August 1991. Figure 2 illustrates the general layout of the Site, and the approximate onsite sampling locations for the RI/FS. The initial phase of activity included the sampling of surface and subsurface soils, battery waste piles, surface water and sediments, landfill materials (solids and aqueous), installation and sampling of twenty monitoring wells, aquifer testing and borehole geophysics, air sampling and meteorological monitoring, a survey of the Site buildings, drainage structures, and underground storage tanks, and an ecological characterization of surface water, wetland, and terrestrial habitats. The second phase of sampling work was primarily a confirmatory resampling of groundwater, surface water and sediments, and also included additional soil sampling (offsite). In addition to this work, limited sampling was completed between March and May 1992 to address concerns regarding offsite soil lead levels and the potential for groundwater contamination migration to the bedrock aquifer beneath the Site.

The results of the RI/FS show that lead is the most abundant, widespread, and concentrated contaminant present on the Site. Arsenic, cadmium, copper and zinc were also identified as

FIGURE 2



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contaminants of concern in the various media present onsite. Low concentrations of other metals and organic contaminants were also sporadically detected in soils and other media, but these contaminants are relatively minor and do not pose significant risk to public health or the environment. Based on the RI/FS sampling, the principal threats posed by the Site are: 1)the battery casings and piles of dusts and sludges remaining from Tonolli's operation; 2) the lead contaminated sediments in the onsite drainage network and in Nesquehoning Creek; and, 3) the lead contaminated solids and standing water in the onsite landfill. Lower level threats posed by the Site include the overburden groundwater contaminated with arsenic, lead, and cadmium, and the contaminated soils that are present in limited portions of the Site.

B. NATURE AND EXTENT OF CONTAMINATION

Waste Piles, Byproducts, and Sump Sediments

Several types of battery wastes from Tonolli's operation and byproducts resulting from EPA's Removal activities are present in various areas of the Site. The sediments present in the onsite drainage network are also included in this category due to their high lead concentration. The waste pile and byproduct materials include approximately 13,000 cubic yards of battery casings, 2,020 cubic yards of treated sludges, 243 cubic yards of dust piled in the crusher and smelter buildings, 210 cubic yards of excavated lagoon soils, and 250 drums of melted plastic remaining from Tonolli's recycling activities. All waste pile materials except the melted plastic were found to contain lead ranging from 6,930 parts per million (ppm) to 317,000 ppm.

Soils

The entire area of the Tonolli Site has been contaminated with lead at concentrations ranging from background levels to 95,200 ppm. Background levels for soils on and around the Site ranged from 152 ppm to 433 ppm lead. Impacted soils appear to be limited to the unpaved areas of the Site, and the elevated concentrations appear to be generally limited to the top three feet of soil. Along portions of the onsite drainage ditches, and in two locations to the north/northeast of the refinery building, the lead impacts extend to a depth of five to ten feet. Approximately 39,000 cubic yards of soils contaminated with lead above a concentration of 1,000 ppm will require remediation.

An area of soils to the immediate west of the Tonolli property boundary appears to contain lead at elevated levels. This area is situated adjacent to the main entrance and receiving area for the truck traffic associated with Tonolli's operation. The RI data showed that this area of the Site contains high levels of lead in soils. It is probable that, due to the heavy traffic associated with the delivery of scrap batteries to the Site, contaminants may have been transported via wind dispersion to the residential area near the Tonolli property entrance. Meteorological data collected during the RI support this potential pathway by showing that wind patterns in the Site area include a westerly component. Two residential dwellings are situated on this property to the west of the Tonolli property entrance. The sampling data collected from this area shows that the lead concentrations in surface soils range from 25 ppm to 4,410 ppm. This area will require additional sampling prior to remediation.

Surface Water and Sediment

Portions of Nesquehoning Creek and Bear Creek have elevated levels of lead present in creek water and sediments. Lead concentrations in surface water exceeded the Ambient Water Quality Criteria (AWQC) at the southwest corner of the Site in Bear Creek, and along the southern border of the Site in Nesquehoning Creek. Impacted sediments appear to be limited to a small portion of Bear Creek where an outfall (underground pipe) leads from the Site to the creek, and an area of Nesquehoning Creek that is situated downgradient from the Site along the southern property boundary. The primary mechanism of impact is apparently stormwater runoff from contaminated soils. Levels of lead (average 600 ppm) and arsenic (average 34 ppm) increased in sediments adjacent to the Site as compared to upstream samples. Copper levels increased from upstream to downstream areas (12.3 ppm to 33.3 ppm on average). An appropriate cleanup level for contaminated sediments must be determined through the completion of additional sampling and bioassays prior to remediation.

Approximately 16.3 million gallons of contaminated stormwater is generated each year as rainfall flows across the Site. This water is collected in the onsite drainage network, and then stored and treated using the onsite treatment system which includes a combination of bag filters, sand filters and an ion exchange resin.

Approximately 2 million gallons of standing water are present within the onsite rubber-lined landfill. This water contains elevated concentrations of lead, and will require remediation prior to closure of the landfill.

Landfill

The onsite landfill covers approximately 10 acres along the eastern boundary of the Site. The landfill was an interim status landfill under the RCRA regulations during Tonolli's operation at the Site. The landfill is lined with a 1/16th inch butyl rubber flexible membrane liner, and is presently holding approximately

105,000 cubic yards of solid and hazardous waste, and 2 million gallons of standing water. The landfill liner appears to be functioning as an effective barrier against any leaching of the landfill contents into the subsurface. The landfill is topographically isolated (i.e., situated at a higher elevation) from the remainder of the Site, does not receive runoff from the Site, and contains a non-homogeneous mixture of rubber and plastic battery casing chips, calcium sulfate sludge, and slag from the onsite smelting operations. The range of lead concentrations present in the solid materials within the landfill is from 11,200 ppm to 68,300 ppm. The landfill materials also contain levels of arsenic, cadmium, copper, and zinc that are elevated with respect to background. The pH of the water sampled within the landfill ranges from 9.78 to 11.09.

Groundwater

OVERBURDEN AQUIFER

The aquifer of concern regarding the Tonolli Site is found in the alluvium and mine spoil material. Groundwater in this aquifer is derived solely from the infiltration of precipitation and recharge from the underlying bedrock aquifer. The Tonolli facility was constructed on a layer of mine spoils ranging in thickness from 0 to 19 feet. A Quaternary alluvium, ranging in thickness from 74 to 113 feet directly underlies the mine spoil layer. The surficial water table aquifer is present in the alluvial deposit and mine spoil materials beneath the Site. Water level measurements from onsite monitoring wells indicate that the horizontal flow direction of the shallow groundwater is southeast across the Site toward Nesquehoning Creek. The vertical groundwater flow in the overburden aquifer is downward in the northern portion of the Site and upwards (discharging to the Creek) in the southern portion of the Site.

Several dissolved metals were detected in the Site monitoring wells in concentrations above background levels. These metals include lead, arsenic, cadmium, copper, and zinc, which are typical components of batteries and battery wastes. Prior to Tonolli's lead smelting operation, the Site and surrounding area were used for disposal and stockpiling of mine spoils and fly ash. At present, the Site is surrounded by approximately 2.8 million cubic yards of mine spoils and fly ash from the previous uses of the Site property. The presence of mine spoils under and around the Site is a potential contributing anthropogenic source of groundwater quality degradation in the area. The presence of elevated concentrations of dissolved metals from both waste sources and anthropogenic sources can be attributed to the dumping of battery acid from the Site operations combined with the "acid-mine drainage" effects of mine spoils. These impacts have reduced the groundwater pH in most of the onsite areas, and thus allowed for the increased dissolution of these metals.

Lead, cadmium and arsenic were the contaminants detected in elevated concentrations in filtered groundwater samples collected from Site monitoring wells constructed within the overburden aquifer. Dissolved lead was detected in six monitoring wells sampled during the RI in concentrations ranging between 6.7 ppb and 328 ppb. Cadmium was detected in the same six monitoring wells in concentrations ranging between 2.8 ppb and 77 ppb. Arsenic was also detected in concentrations ranging between 17 ppb and 313 ppb. The groundwater impacts observed within the overburden aquifer (Wells 11, 12, 13, 14, and 16) appear to be limited to the central portion of the Site, adjacent to or downgradient from the previous battery processing and waste disposal areas.

BEDROCK AQUIFER

The bedrock aquifer system underlying the Tonolli Site is found in the Mauch Chunk formation. This aquifer is a current and potential source of drinking water. The Lansford Coaldale Water Authority supplies drinking water from the bedrock aquifer to approximately 20,000 users in the area. The direction of groundwater flow in the bedrock aquifer is generally to the east. Groundwater in the bedrock aquifer is stored and transmitted via intergranular voids and fractures. The number and degree of interconnection of these voids and fractures dictates the volume and maximum flow rate of available groundwater. Fracturing in the Mauch Chunk occurs both as bedding plane fractures and as a series of fracture orientations perpendicular to bedding.

Based on a survey completed during the RI, several wells drilled into the Mauch Chunk formation, or bedrock aquifer, were found to be under confined or semiconfined conditions. The evaluation of groundwater flow patterns in the onsite monitoring wells confirmed the presence of confined to semiconfined conditions in the bedrock aquifer underlying the Tonolli Site.

Sampling and well construction activities completed during the RI/FS at Tonolli primarily focused on the overburden aquifer as the water-bearing zone of concern for the Site. In general, the results of the sampling and testing show that Site contaminants (lead, arsenic, cadmium) followed the most likely migration pathway of infiltration to groundwater, and are present within the alluvial material which underlies the Site. At one location where groundwater was sampled at the overburden bedrock interface (Well 12D), lead, cadmium, and copper were detected at elevated levels. A deep bedrock well (12B) was constructed and sampled at this same location. A very distinct difference was seen in the overall water chemistry (pH, specific conductance, TDS, sulfates) of the two wells, showing that the Site-related impacts appear to be confined to the overburden aquifer.

SEEPS

Ten seeps of various flow rates were observed along the northern bank of Nesquehoning Creek during the RI. The seeps occurred in areas directly downgradient from the major operations areas at the Site, and also emanate from the large mine spoil pile situated along the eastern boundary of the Site. The seeps correspond in elevation to the contact between the alluvium and mine spoil which underlie the Site. This interface appears to serve as a migration pathway for horizontal movement of shallow groundwater, and provides additional base flow to the Nesquehoning Creek. Concentrations of lead, arsenic, and cadmium detected in the seep samples were elevated with respect to background.

Air

Air sampling and analysis was completed during the RI to assess the potential risk posed by airborne dust and lead particles. Four high-volume air samplers were placed around the Site, and a wind speed and direction monitor were mounted on the flag pole at the Site's entrance. The highest 90-day average concentration of lead detected during the monitoring was 0.0549 micrograms per cubic meter (ug/m^3). This level was well below the national ambient air quality standard (NAAQS) of 1.5 ug/m^3 for lead.

Total suspended particulates (TSP) at the Site averaged 44.1 ug/m^3 at the upwind location. This average did not change significantly, but tended to decrease slightly at the downwind locations. The majority of the ambient TSP may be due to the presence of the large, unvegetated coal refuse piles situated offsite.

Onsite Buildings and Scrap Piles

The buildings on the Tonolli Site are in various stages of deterioration. The refinery building has numerous holes in or near the roof which allows rain to enter the building. This water is collected in low lying areas within the building and in some areas is beginning to erode the material stockpiled by EPA during the removal work. A dust sample from near the furnace area was analyzed for lead and found to contain 221,000 ppm. The Toxicity Characteristic Leaching Procedure (TCLP) leachate had detectable levels of cadmium and lead at concentrations of 33.7 mg/l and 15.5 mg.l respectively.

Several scrap piles are present at the Site and generally consist of scrap metal that is rusted and wooden pallets. These piles were not sampled during the RI. One pile consists of a black material that is believed to be slag. The soil immediately adjacent to this pile was sampled via field screening (XRF) and had a lead concentration of approximately 39,000 ppm.

Approximately 120 nickel-iron batteries are grouped in eight to ten racks, and are situated to the east of the battery receiving and storage area at the Site. Most of these batteries appear to be open and are drained.

Stormwater Piping and Underground Tanks

Site records, including design drawings and plant layout drawings, were reviewed during the RI to assess Site stormwater drainage and underground storage tanks. The records indicate several underground storage tanks present at the Site, and several underground stormwater drainage pipes. Due to incomplete information, the connections of certain sumps and stormwater catch basins are not known. Three of the underground storage tanks identified during the RI contain fuel oil or gasoline, and one is empty. This tank is also believed to have contained petroleum products in the past. In addition to the above, there is a possibility that another storage tank exists directly in front of the onsite office building.

V. CONTAMINANT FATE AND TRANSPORT

Lead is the most widespread and concentrated contaminant present on the Site and was identified as the contaminant of greatest health concern on the Site based on the baseline risk assessment. Additional contaminants of major concern for the Site include arsenic, copper, cadmium, and zinc.

Current information about the Tonolli Site indicates that three migration pathways are of concern: surface water, groundwater and air. Potential migration pathways for soil-borne metals may include leaching into groundwater, surface water runoff into drainage ditches and the creeks, where contaminants may wash out as sediments, and wind dispersion. While wind dispersion did not appear to play an appreciable role in offsite migration of contaminated soils and dust based on sampling completed during the RI, it may have played a more important role during the historical operation at the Site, and thus it is retained as a potential migration pathway.

Water-borne contaminants may follow two migration pathways: surface water discharge and migration through subsurface soils to the groundwater and then discharge into Nesquehoning Creek. The lateral groundwater migration in the immediate vicinity of the Site is toward the southeast. The vertical gradient is downward north of the Site and upward near Nesquehoning Creek.

Data collected during the RI indicate that offsite migration occurs to the air and surface water pathways. Current data on the potential migration of contaminants through groundwater shows that the Site has impacted a limited area of the overburden aquifer. Although the bedrock aquifer beneath the Site exists under confined to semiconfined conditions, and may thus prevent the migration of contaminants from the overburden to the deeper bedrock aquifer, this remains a possible pathway of concern. Additional monitoring within the bedrock will be required during remediation to further evaluate this pathway.

Contaminant Persistence

In general, cationic metals bind readily to clay and organic particles and are relatively persistent in the environment. None of the five contaminants of concern undergoes photochemical reactions to an appreciable degree.

Lead tends to form compounds of low solubility with the major anions of water. Tetraalkyl lead may form by a combination of chemical and biological alkylation of inorganic lead compounds. Lead may accumulate in plants and animals but does not appear to be biomagnified in food chains. Because lead binds very tightly to soil particles, atmospheric lead is generally retained in the upper two to five centimeters of soil.

Arsenic may undergo various transformations including oxidation-reduction reactions, ligand exchange, biotransformation, and/or precipitation and adsorption, resulting in a high degree of mobility in aqueous systems. Arsenate compounds may be methylated by microorganisms and subsequently may volatilize. Significant biomagnification of arsenic in aquatic food chains does not apparently occur.

Cadmium in the atmosphere tends to bind to very small particles, particularly those of fly ash. It is not reduced or methylated by microorganisms. Cadmium is strongly accumulated by all organisms, both through food and water.

Sorption is the predominant reaction of zinc. Zinc is an essential nutrient and is bioaccumulated in biota. Biological activity may affect the mobility of zinc in surface water or groundwater.

Contaminant Deposition and Migration

The battery breaking and smelting activities performed on the Site contributed various forms of lead, sulfuric acid, and other heavy metals to the Site. The handling, storage, onsite treatment and disposal of battery wastes also contributed contaminants to the Site. These activities covered extensive areas of the Site property, but were generally focused on the smelter and crusher buildings, and the wastewater lagoon and onsite landfill. The storage area for broken battery casings also covered a large area to the north of the smelter/refinery.

The RI sample results establish the presence of lead, arsenic, copper, cadmium, and zinc on the Site in soils, sediments, surface water and groundwater. All five of these metals bind readily to clay and organic particles that have negatively charged surfaces. Generally, lead is the most tightly bound of the metals, followed in order by copper, zinc, and cadmium, with arsenic having the greatest mobility.

The vertical distribution of lead in soils was generally limited to the upper five feet. Three onsite areas showed elevated lead levels at a depth between five and ten feet: the area underlying the drainage ditch to the east of the lagoon; the area west of the northern perimeter of the landfill; and an area just north of the smelter/refinery building. These areas also showed elevated levels of cadmium, copper and zinc at the greater sampling depths.

Migration pathways established as a result of the current understanding of the nature and extent of contamination found on the Site are as follows:

Surface Water:	Soil-borne metals transported via runoff caused by precipitation into Nesquehoning and Bear Creeks;
	Surface water infiltration/leaching of metals to subsurface soils and groundwater.
Groundwater:	Vertical and horizontal migration of lead, cadmium and arsenic in dissolved and particulate form;
	Discharge of contaminated groundwater into Nesquehoning Creek.
Air:	Wind or vehicular traffic transport of soils and/or dusts to offsite areas.

Groundwater results indicate that the overburden aquifer in a central portion of the Site has been impacted by lead, cadmium, and arsenic. Due to the unconsolidated nature of the overburden and the presence of mine spoils and fly ash in the overburden, filtered groundwater samples were primarily considered in identifying the dissolved metals that are most likely to be transported through groundwater. Six of the onsite monitoring wells showed elevated levels of metals in dissolved form. These six wells also represent the lowest pH readings, indicating that pH is a factor with regard to contaminant migration. Evaluation of Site hydrogeology indicates that shallow groundwater flows horizontally to the southeast where it discharges to Nesquehoning Creek. Vertical groundwater flow in the alluvium is downward in the northern portion of the Site and upwards (discharge to Creek) in the southern portion of the Site. The bedrock aquifer beneath the Site exists under confined to semiconfined conditions, and tends to prevent leakage downward from the shallow to the bedrock aquifer.

Sediment samples collected in Nesquehoning Creek immediately south of the Site were identified as impacted with regard to arsenic, lead, and possibly cadmium. Sediments in Bear Creek at the southwest corner of the Site also show an impact with regard to lead. Based on the RI data, the elevated lead found in sediments is tightly bound and is not being released to the water column in either dissolved or suspended form.

Population and Environmental Areas Potentially Affected

The Site primarily consists of an abandoned industrial facility, and is part of the 290-acre Green Acres Industrial Park West which extends along the northern side of Route 54 in Nesquehoning. Approximately 20 residences are located within one-quarter mile of the Site, with two homes situated immediately adjacent to the southwest corner of the Tonolli property. Access to the Site is restricted by the perimeter fence, although several trespassing incidents have been reported at the Site. A local contractor provides Site security services. Additional access to the Site is provided for a contractor to perform routine sampling and maintenance as required for the onsite surface water treatment plant.

In addition to the direct exposure to high levels of contamination present in onsite battery waste piles, soils, and to a lesser extent in groundwater, the RI documented the release of contamination into the surface water and sediments of Nesquehoning Creek and a small portion of Bear Creek. Nesquehoning Creek is designated by PADER as a Cold Water Fishery, and its tributary streams, including Bear Creek, are designated as High Quality-Cold Water Fisheries. According to the Pennsylvania Fish Commission, no recreational fishing occurs in Nesquehoning Creek due to the near absence of fish.

VI. SUMMARY OF SITE RISKS

The data collected at the Site during the RI was used to complete a human health and ecological assessment. The baseline risk assessment provides the basis for taking action and indicates the exposure pathways that need to be addressed by the remedial action. It serves as the baseline, indicating what potential risks would exist if no action were taken at the Site. This section of the ROD reports the results of the baseline risk assessment conducted for this Site.

A. Human Health Risks and Exposure Assessment

The evaluation of human health risks is based on the current and potential future land use of the Site. The Tonolli Site covers approximately 30 acres of property that is zoned for industrial use by the current zoning ordinance of the Borough of Nesquehoning. The Site property forms the western boundary of a 290-acre area that comprises the Green Acres Industrial Park West. This industrial park is described in a plan that was sponsored by the Carbon-Schuylkill Industrial Development Corporation in 1973. According to the Carbon County Office of Planning and Development, fulfillment of this plan is still the anticipated future land use for the Site property, as well as properties to the east and south of the Site.

Based upon the information described above, the assessment of human exposure to the Site was completed for a current and most probable future use of the Tonolli property as a part of an industrial park. To determine if human and environmental exposure to the Site contaminants might occur in the absence of remedial action, an exposure pathway analysis was performed. An exposure pathway is comprised of four necessary elements: 1) a source and mechanism of chemical release; 2) an environmental transport medium; 3) a human or environmental exposure point, and, 4) a feasible human or environmental exposure route at the point of exposure.

The assessment of health risks that could result from exposure to contaminated Site materials specifically evaluated the following exposure pathways:

1. Ingestion of contaminated waste piles, byproducts, or sump sediments by an older child trespasser or long term onsite adult worker.

2. Ingestion of contaminated soils by an older child trespasser, a long term onsite adult worker, and an offsite resident child or adult.

3. Inhalation of fugitive dust by an older child trespasser, an offsite resident child or adult, a long term onsite adult worker, and a short term onsite construction worker.

4. Ingestion of contaminated groundwater by a long term onsite adult worker.

5. Ingestion of homegrown vegetables grown in contaminated offsite soils by an offsite resident child or adult.

A summary of potential Site-related exposure pathways that were considered and fully evaluated in the risk assessment is shown in

Tables 1 and 2.

The baseline risk assessment focused on lead, arsenic, cadmium, copper, and zinc as the contaminants of major concern. In general, the RI data were used to develop exposure point concentrations for calculating potential health risks posed by exposure to Site contaminants via the pathways listed in Tables 1 and 2. In each medium at the Site, for each contaminant of concern, except lead, the 95th percent Upper Confidence Limit of the arithmetic average concentration was used to describe the exposure point concentration. The exposure point concentrations developed for the Site and used to calculate potential health risks are shown in Tables 3 through 6. The major assumptions about exposure frequency and duration that were included in the exposure assessment are shown in Table 7.

For lead, a different approach for calculating risk was employed. Presently, the only credible model available for evaluating exposure to lead is the Integrated Uptake/Biokinetic (IU/BK) Model. There are limitations, however, with regard to application of the IU/BK model. The IU/BK model is capable of assessing the impacts of lead exposure in only the most susceptible subpopulation to lead toxicity, young children. In its current form, the IU/BK model can not be used as a predictive tool for adults,. however it can be used as a baseline for comparison. Although it is recognized that land use at the Tonolli Corporation Site is considered industrial, the IU/BK model was incorporated in the baseline risk assessment to provide comparative exposure information on the contaminant of probably single greatest concern at the Site, lead. The exposure parameters used in the IU/BK model, as well as the predicted impacts, are presented in Tables 8A and 8B.

B. Toxicity Assessment

The toxicological properties of the contaminants of concern and the toxicological basis of the health effects criteria summarized in Table 9 are discussed in this section. The purpose of these summaries is to provide general information on the health effects of the selected chemicals and to present pertinent toxicological results used to calculate and quantify toxicity criteria for the Site. The criteria derived from the toxicological studies will be used in conjunction with the estimated exposure levels to evaluate potential human health risks.

Slope factors (SFs) have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic contaminants of concern. SFs, which are expressed in units of $(mg/kg\text{-}day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake

Table 1

CURRENT LAND-USE EXPOSURE PATHWAYS AT THE TONOLLI SITE

osure ium	Mechanisms of Release	Exposure Point	Potential Receptor	Route of Exposure	Pathway Complete?	Quantitatively Evaluated? Basis.
face Soil	Direct contact with existing soil	Off site	Residents (a)	Incidental ingestion	Yes	Yes. Evaluated under future land use scenario.
face Soil	Direct contact with existing soil	On site	Trespassers (b)	Incidental ingestion	Yes	Yes, for all metals. On-site surface soil data.
face Soil	Direct contact with existing soil	Off and on site	All receptors	Dermal exposure	No	No. Metals are not significantly absorbed from a dry soil matrix.
surface Soil	Direct contact with existing soil	On site	Trespassers (b)	Incidental ingestion	No	No. Ground instrusive activities are not likely to be performed by trespassing older children.
	Fugitive dust from surface soils	Off site	Residents (a)	Inhalation	Yes	Yes. Air monitoring results for soil data ratios for other metals
	Fugitive dust from surface soils	On site	Trespassers	Inhalation	Yes	Yes. Air monitoring results for soil data ratios for other metal
face Water	Surface run-off, seeps, and ground water recharge to Nesquehoning Creek	Off site	Residents	Incidental ingestion	No	No. No recreational use of Nesquehoning or Bear Creeks.
face Water	Surface run-off, seeps, and ground water recharge to Nesquehoning Creek	Off site	Residents	Dermal exposure	No	No. No recreational use of Nesquehoning or Bear Creeks.
ek Sediment	Site surface run-off or seeps	Off site	Residents	Ingestion	No	No. No recreational use of Nesquehoning or Bear Creeks.
h	Ingestion of surface water	Off site	Residents	Ingestion	No	No. No fish population in Nesquehoning or Bear Creeks.
eta	Uptake from soil, translocation into vegetables, deposition from air	Off site	Residents	Ingestion of home grown produce	Yes	Yes. Evaluated under future lan use scenario.
ison	Ingestion of surface water	Off site	Residents	Ingestion	No	No. The chemicals of potential concern have a low potential for bioaccumulation in deer.
und Water	Leaching to ground water and water transport within aquifer	Off site	Residents	Ingestion	No	No. Only nearby production well are upgradient in the bedrock aq
p/Pile Material	Direct contact with materials in piles, sumps, buildings, and landfill	On site	Trespassers	Ingestion	Yes	Yes. On-site waste materials da

For chemicals other than lead, evaluated for two age groups: 0-6 years, and 19 and older. For lead, evaluated for 0-6 years and 7 and older.
Evaluated for older children ages 8-14.

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Table 2

FUTURE EXPOSURE PATHWAYS

Exposure Medium	Mechanisms of Release	Exposure Point	Potential Receptor	Route of Exposure	Pathway Complete?	Quantitatively Evaluated? Basis.
Surface Soil	Direct contact with surface soils	On site	Worker (a)	Ingestion	Yes	Yes. On-site soil data.
Surface Soil	Direct contact with surface soils	On site	Residents (b)	Ingestion	Yes	Yes. On-site soil data.
Surface Soil	Direct contact with surface soils	Off site	Residents (b)(c)	Ingestion	Yes	Yes. Off-site soil data.
Sump/pile material	Direct contact with materials in piles, sumps, buildings, and landfill.	On site	Residents (b)	Ingestion	Yes	Yes. Sump/pile materials data.
Air	Fugitive dust from surface soils	On site	Worker (a)(d)	Inhalation	Yes	Yes. Air monitoring data and metal ratios in soil.
Air	Fugitive dust from surface soils	On and off site	Residents (b)	Inhalation	Yes	Yes. Air monitoring data and metal ratios in soil.
Vegetables	Uptake from soil, translocation into vegetables, deposition from air.	On site	Residents (b)	Ingestion	Yes	Yes. Methodology of Baes et al. (1984)
Vegetables	Uptake from soil, translocation into vegetables, deposition from air.	Off site	Residents (b)(c)	Ingestion	Yes	Yes. Methodology of Baes et al. (1984)
Ground Water	Leaching to ground water	On site	Worker (a)	Ingestion	Yes	Yes. On-site groundwater data.
Ground Water	Leaching to ground water	On site	Residents (b)	Ingestion	Yes	Yes. On-site groundwater data.

(a) Evaluated for adults only.
(b) Evaluated for two age groups: 0-6 years, and 19 and older.
(c) Off-site exposure to soils and vegetables will be evaluated for two separate off-site areas. See text.
(d) Exposure to fugitive dust by workers will be evaluated for two worker scenarios: Long term industrial and short term construction.

Table 3

ON-SITE SURFACE SOIL EXPOSURE POINT CONCENTRATIONS

Chemical	Average Exposure Point Concentration (mg/kg)	RME Exposure Point Concentration (mg/kg)	Maximum Measured Concentration (mg/kg)
SITE-WIDE (a)			
Arsenic	61	134	411
Cadmium	10.6	41.7	130
Copper	419	377	8,440
Lead	8,300	74,900	95,200
Zinc	167	311	1,480

(a) Calculated using all soil samples in footnotes (b) and (c) combined.
(b) Calculated using samples S4A, S5A, S7A, S8-0,S10-0, S14-0.5, and S65-0. at 0 feet and 0.5 feet.
(c) Calculated using samples S16, S28, S35 - S39, S41, S42, S63, S64, S66-S70, S73, S74, OFF-4, OFF-5, and OFF-11 at 0 feet to 0.5 feet. Soil samples OFF-17 and OFF-18 were used for lead only, as data was not available for the other metals of concern at these locations.

Table 4

OFF-SITE SURFACE SOIL EXPOSURE POINT CONCENTRATIONS (a)

Chemical	Average Exposure Point Concentration (mg/kg)	RME Exposure Point Concentration (mg/kg)	Maximum Measured Concentration (mg/kg)
WEST (a)			
Arsenic	10.1	16.7	17.3
Cadmium	2	3.4	3.4
Copper	33.2	42.9	45.7
Lead	433	740	846
Zinc	60.7	102	102
NORTH, EAST, SOUTH (b)			
Arsenic	12.7	22.2	44.9
Cadmium	0.9	2.2	2.2
Copper	25.4	37.1	46.9
Lead	145	243	438
Zinc	553	4,240	4,240

(a) Based on data from the following off-site soil sampling locations: 1, 2, 29, 30, 31, 32, 34-38. Samples 12 through 34 were analyzed for lead only. Samples collected by EPA and Rizzo Assiciates.
(b) Based on data from the following off-site soil sampling locations: 3, 6-10, 12-16, 19-28, 33 (duplicate of 23), 39, 40. Samples 12 through 34 were analyzed for lead only. Samples collected by EPA and Rizzo Assiciates.

Table 5

EXPOSURE POINT CONCENTRATIONS FOR STOCKPILED MATERIALS AND SUMP SEDIMENTS(a)

Chemical	Average Exposure Point Concentration (ug/L)	Reasonable Maximum Exposure Point Concentration (ug/L)	Maximum Concentration (ug/L)
Arsenic	505	2,760	3,020
Cadmium	414	2,170	2,170
Copper	1,090	3,120	3,120
Lead	111,000	317,000	317,000
Zinc	3,090	18,500	18,500

(a) Based on samples S-71, S-72, SUMP1, SUMP2, SUMP3, WA-W4, WA-W5, WA-W6, WA-W7, WA-W11 (duplicate of WA-W7), WA-W10, WA-XRFC1, WA-XRFC2.

Table 6

EXPOSURE POINT CONCENTRATIONS FOR GROUNDWATER IN THE HOT SPOT AREAS (a)

Chemical	Average Exposure Point Concentration (ug/L)	Reasonable Maximum Exposure Point Concentration (ug/L)	Maximum Concentration (ug/L)
Arsenic (b)	79.5	313	313
Cadmium (c)	25.3	77	77
Copper (c)	66.5	140	140
Lead (c)	65.5	328	328
Zinc (c)	403	1,130	1,130

(a) Dissolved concentrations were used to estimate exposure due to ingestion of groundwater.
(b) Calculated using well clusters MW14 and MW15.
(c) Calculated using well clusters MW11 and MW12.

Table 7

SUMMARY OF EXPOSURE PARAMETERS USED FOR THE TONOLLI HUMAN HEALTH AND ECOLOGICAL ASSESSMENT

Exposure Pathway	Exposure Parameters Used: Average Case	Exposure Parameters Used: RME Case
SOIL INGESTION		
Older Child Trespasser *		
	EF = 8 dys/yr ED = 7 yrs IR = 13 mg/day FI = 0.25 BW = 41 kg	EF = 34 dys/yr ED = 7 yrs IR = 100 mg/day FI = 0.25 BW = 41 kg
Adult Worker *		
	EF = 172 dys/yr ED = 8.4 yrs IR = 7 mg/day FI = 0.5 BW = 70 kg	EF = 172 dys/yr ED = 25 yrs IR = 100 mg/day FI = 0.5 BW = 70 kg
Adult Resident *		
	EF = 350 dys/yr ED = 30 yrs IR = 7 mg/day FI = 1.0 BW = 70 kg	EF = 350 dys/yr ED = 30 yrs IR = 100 mg/day FI = 1.0 BW = 70 kg
Child Resident *		
	EF = 350 dys/yr ED = 7 yrs IR = 114 mg/day FI = 1.0 BW = 14.5 kg	EF = 350 dys/yr ED = 7 yrs IR = 200 mg/day FI = 1.0 BW = 14.5 kg
GROUNDWATER INGESTION		
Adult Worker		
	EF = 241 dys/yr ED = 8.4 yrs IR = 1.4 L/day FI = 0.5 BW = 70 kg	EF = 241 dys/yr ED = 25 yrs IR = 2 L/day FI = 0.5 BW = 70 kg
Adult Resident		
	EF = 350 dys/yr ED = 30 yrs IR = 1.4 L/day FI = 1.0 BW = 70 kg	EF = 350 dys/yr ED = 30 yrs IR = 2 L/day FI = 1.0 BW = 70 kg
Child Resident		
	EF = 350 dys/yr ED = 7 yrs IR = 0.4 L/day FI = 1.0 BW = 14.5 kg	EF = 350 dys/yr ED = 7 yrs IR = 0.8 L/day FI = 1.0 BW = 14.5 kg

Please see footnotes on the following page.

Table 7

SUMMARY OF EXPOSURE PARAMETERS USED FOR THE TONOLLI HUMAN HEALTH AND ECOLOGICAL ASSESSMENT

Exposure Pathway	Exposure Parameters Used: Average Case	RME Case
DUST INHALATION		
Older Child Trespasser		
	NA	EF = 34 dys/yr
	NA	ED = 7 yrs
	NA	ET = 4 hrs/day
Adult Long Term Industrial Worker		
	NA	EF = 241 dys/yr
	NA	ED = 25 yrs
	NA	ET = 8 hrs/day
Adult Short Term Construction Worker		
	NA	EF = 30 dys/yr
	NA	ED = 1 yr
	NA	ET = 8 hrs/day
Adult Resident		
	NA	EF = 350 dys/yr
	NA	ED = 30 yrs
	NA	ET = 24 hrs/day
Child Resident		
	NA	EF = 350 dys/yr
	NA	ED = 7 yrs
	NA	ET = 24 hrs/day
VEGETABLE INGESTION		
Adult Resident *		
	NA	EF = 350 dys/yr
	NA	ED = 30 yrs
	NA	IRV = 26 g/day
	NA	IRR = 34 g/day
	NA	IRL = 20 g/day
	NA	BW = 70 kg
Child Resident *		
	NA	EF = 350 dys/yr
	NA	ED = 7 yrs
	NA	IRV = 16 g/day
	NA	IRR = 48 g/day
	NA	IRL = 11 g/day
	NA	BW = 70 kg

Please see footnotes on the following page.

Table 7

SUMMARY OF EXPOSURE PARAMETERS USED FOR THE TONOLLI HUMAN HEALTH AND ECOLOGICAL ASSESSMENT

Exposure Pathway	Exposure Parameters Used: Average Case	RME Case

NOTES:

EF = Exposure Frequency
ED = Exposure Duration
ET = Exposure Time
IR = Ingestion Rate
IRV = Ingestion Rate for Vine Crops
IRR = Ingestion Rate for Root Crops
IRL = Ingestion Rate for Leafy Crops
FI = Fraction Ingested (i.e., the fraction of waking hours that receptor is in contact with the site.
BW = Body Weight
NA = Not Applicable; pathway was evaluated for RME case only.

* = For these pathways, relative oral bioavailability factors from Fraser and Lum (1983) were used. Use of these values is not typical for USEPA Region III risk assessments. However, their use in this case does not impact the final decision for this site and they have been included in the risk calculations. The values used were 0.294 for arsenic, 0.11 for cadmium, 0.105 for copper, and 0.099 for zinc.

level. The term "upper bound" reflects the conservative estimate of the risks calculated from the SF. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Slopefactors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied.

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from exposure to contaminants of concern exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of contaminants of concern from environmental media can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (i.e., to account for the use of animal data to predict effects on humans).

1. Lead

Exposure to lead via inhalation and ingestion can cause potential carcinogenic and noncarcinogenic adverse health effects. The following discussion presents toxicological information and toxicity values for the carcinogenic and noncarcinogenic effects of lead.

Carcinogenic Effects - The Carcinogen Assessment Group (CAG) of the U.S. EPA has recently assigned a weight-of-evidence classification of B2 to lead, indicating that lead is a probab human carcinogen. The B2 classification was assigned on the basis of sufficient animal evidence, with inadequate human evidence.

Noncarcinogenic Effects - The noncarcinogenic toxicological effects of lead are well documented. Lead affects the following human systems or organs:

- Hematopoietic system
- Central nervous system
- Kidneys
- Gastrointestinal system
- Bone marrow cells
- Reproductive system
- Endrocrine system
- Heart
- Immune system.

The consensus on the blood lead (Pb-B) level of children which is considered toxic has changed in recent years. In 1975, the U.S. Centers for Disease Control (CDC) defined the toxic level in

Table 8A

UBK MODEL PARAMETERS USED TO ESTIMATE
BLOOD LEAD LEVELS FOR RESIDENTS AGES 0-7

Medium/Parameter	UBK Default Parameter		Site-specific Parameter
Air Data:			
Air Concentration	0.20 ug Pb/m3		0.12 ug Pb/m3
Indoor Air Percentage of Outdoor Air	30%		
Lung Absorption	32.0%		
Vary Air Conc. by Year	No		
Age Specific Data:			
Age	Ventilation Rate	Time Spent Outdoors	
0-1	2.0 m3/day	1 hr/day	
1-2	3.0 m3/day	2 hr/day	
2-3	5.0 m3/day	3 hr/day	
3-4	5.0 m3/day	4 hr/day	
4-5	5.0 m3/day	4 hr/day	
5-6	7.0 m3/day	4 hr/day	
6-7	7.0 m3/day	4 hr/day	
Water Data:			
Water Concentration	4.00 ug/l		27.7 ug/l (a)
Absorption	50%		
Water Consumption			
Age: 0-1	0.20 l/day		
1-2	0.50 l/day		
2-3	0.52 l/day		
3-4	0.53 l/day		
4-5	0.55 l/day		
5-6	0.58 l/day		
6-7	0.59 l/day		
Diet Data:			
Absorption	50%		
Diet Intake			
Age: 0-1	5.88 ug Pb/day		
1-2	5.92 ug Pb/day		
2-3	6.79 ug Pb/day		
3-4	6.57 ug Pb/day		
4-5	6.36 ug Pb/day		
5-6	6.75 ug Pb/day		
6-7	7.48 ug Pb/day		

Table 8B

UBK RESULTS FOR CHILD RESIDENT
AGES 0 - 84 MONTHS

Scenario	Soil Concentration (mg/kg)	Geometric Mean Blood Lead Level (ug/dl)	Percent of Population Above Blood Level Cut-Off (10 ug/dL) GSD = 1.42	GSD = 1.7
ON-SITE SURFACE SOIL:				
Without ingestion of home grown vegetables	8,300	46 (a)	>99.9 (a)	99.7 (a)
With ingestion of home grown vegetables	8,300	71 (a)	>99.9 (a)	>99.9 (a)
ON-SITE SUMP SEDIMENT/ PILE MATERIAL:				
Without ingestion of home grown vegetables	111,000	NC	NC	NC
OFF-SITE TO THE WEST:				
Without ingestion of home grown vegetables	433	5.2	2.9	10
With ingestion of home grown vegetables	433	9.0	34.6	38.9
OFF-SITE TO THE NORTH, SOUTH AND EAST:				
Without ingestion of home grown vegetables	145	2.8	0.01	0.71
With ingestion of home grown vegetables	145	4.5	0.98	6.2

NC = Not calculated; model could not be run with a concentration of 111,000 mg/kg lead, as unrealistic results would occur.

(a) These results are biologically implausible and have occurred because the UBK model cannot adequately predict the plateau effect observed in population blood lead concentration curves as soil lead concentrations increase to very high levels.

Table 9

CRITICAL TOXICITY VALUES FOR CHEMICALS OF POTENTIAL CONCERN
AT THE TONOLLI SITE

Chemical	Chronic Inhalation RfC (mg/kg-day) [Uncertainty Factor] (a)	Subchronic Inhalation RfC (mg/kg-day) [Uncertainty Factor]	Target Organ (b)	RfC Source	Unit Risk (ug/m3)-1	EPA Weight of Evidence Classification (c)	UF Source
Inhalation:							
Arsenic	---	---	---	---	4.30E-03	A	IRIS
Cadmium	---	---	---	---	1.80E-03	B1	IRIS
Copper	---	---	---	---	---	---	---
Lead	---	---	---	---	---	B2	IRIS
Zinc	---	---	---	---	---	D	IRIS

Chemical	Chronic RfD (mg/kg-day) [Uncertainty Factor] (a)	Subchronic RfD (mg/kg-day) [Uncertainty Factor]	Target Organ (b)	RfD Source	Slope Factor (SF) (mg/kg-day)-1	EPA Weight of Evidence Classification (c)	SF Source
Oral:							
Arsenic	1.00E-03 [1]	1.00E-03 [1]	Skin	HEAST	1.75E+00 (d)	A	IRIS
Cadmium (water)	5.00E-04 [10] (e)	---	Kidney	IRIS	---	---	IRIS
Cadmium (food)	1.00E-03 [10] (e)	---	Kidney	IRIS	---	---	IRIS
Copper	3.70E-02 [1] (f)	3.70E-02 [1] (f)	GI Irritation	HEAST	---	---	---
Lead	---	---	CNS	IRIS	---	B2	IRIS
Zinc	2.00E-01 [10] (e)	2.00E-01 [10] (e)	Anemia	HEAST	---	---	---

(a) Uncertainty factors are a measure of the uncertainty in the data available. A higher uncertainty factor represents a greater amount of uncertainty in the data.
(b) A target organ is the organ most sensitive to a chemical's toxic effect. RfDs are based on toxic effects in the target organ. If an RfD was based on a study in which a target organ was not identified, an organ or system known to be affected by the chemical is listed.
(c) EPA Weight of Evidence for Carcinogenic Effects:
  [A] = Human carcinogen based on adequate evidence from human studies; and
  [B1] = Probable human carcinogen based on limited human data;
  [B2] = Probable human carcinogen based on inadequate evidence from human studies and adequate evidence from animal studies.
  [D] = Not classified as to human carcinogenicity.
(d) A unit risk of 5E-05 (ug/L)-1 has been proposed by the risk assessment forum and this recommendation has been scheduled for review (SAB). This is equivalent to 1.75 (mg/kg-day)-1 assuming a 70 kg individual ingests 2 L/day.
(e) Variation in human sensitivity.
(f) The current drinking water standard of 1.3 mg/L has been converted to an RfD assuming a 70 kg individual ingests 2 L of water per day.

NOTE: IRIS = Integrated Risk Information System.
-- = No information available.

children's blood as 40 micrograms per deciliter (ug/dl). This value was reduced in 1985 by the CDC to 25 ug/dl. In 1986, the World Health Organization (WHO) recommended 20 ug/dl as the upper acceptable limit for children. In the same year, EPA's Clean Air Scientific Advisory Committee indicated that levels of 10 to 15 ug/dl can be associated with adverse health effects in children. In October, 1991, the CDC recommended an intervention level of 10 ug/dl. Consequently, a Pb-B level of 10 ug/dl was used as the Pb-B limit for children, below which children should not be considered at risk from exposure to lead, according to currently available data.

For adults, particularly white males of 40 to 59 years old, studies have indicated that increases in blood pressure are associated with Pb-B levels ranging from possibly as low as 7 ug/dl to 30 or 40 ug/dl. As a result, a Pb-B level limit of 10 ug/dl was used for adults, a level below which adults should not be considered at risk from exposure to lead.

Although lead has been classified as a probable human carcinogen by EPA's CAG, EPA has considered it inappropriate to develop a reference dose (RfD) for inorganic lead and lead compounds, since many of the health effects associated with lead intake occur essentially without a threshold. Therefore, it is not possible to calculate a cancer risk number as it is done for other contaminants. In order to evaluate the human health risks posed by exposure to lead, EPA uses an uptake model, the Integrated Uptake/Biokinetic Model (IU/BK). This model takes into account the uptake of lead from multiple exposure pathways, and estimates the resulting blood lead levels of the exposed person(s).

2. Arsenic

Arsenic has been classified as a Group A human carcinogen by EPA's CAG. Ingestion of arsenic results in an increased incidence of skin cancers, although only a fraction of the arsenic-induced skin cancers are fatal. The assumption of a linear relationship between arsenic dose and cancer risk may overestimate the risk. EPA believes that the uncertainties associated with ingested inorganic arsenic are such that risk estimates could be modified downwards as much as tenfold relative to risk estimates associated with other carcinogens.

Epidemiological studies of workers in smelters and in plants manufacturing arsenical pesticides have shown that inhalation of arsenic is strongly associated with lung cancer and perhaps with hepatic angiosarcoma. Ingestion of arsenic has been linked to a form of skin cancer and more recently to bladder, liver, and lung cancer. Dermal absorption of arsenic is not significant. Acute exposure of humans to metallic arsenic has been associated with gastrointestinal effects, hemolysis, and neuropathy. Chronic

Table 10

SUMMARY OF POTENTIAL HUMAN HEALTH RISKS
Current Site Use Scenario

RECEPTOR	EXCESS LIFETIME CANCER RISK*	HAZARD QUOTIENT			
		Arsenic	Cadmium	Copper	Zinc
Older Child Trespasser:					
Incidental Ingestion of Soil	$3x10^{-7}$	$2x10^{-3}$	$2x10^{-4}$	$3x10^{-4}$	$1x10^{-5}$
Incidental Ingestion of Sump/Pile Material	$8x10^{-6}$	$5x10^{-2}$	$1x10^{-2}$	$5x10^{-4}$	$5x10^{-4}$
Inhalation of Fugitive Dust	$7x10^{-9}$	NA	NA	NA	NA
TOTAL	$8x10^{-6}$	$5x10^{-2}$	$1x10^{-2}$	$8x10^{-4}$	$5x10^{-4}$
Adult Off-Site Resident:					
Inhalation of Fugitive Dust	$2x10^{-6}$	NA	NA	NA	NA
TOTAL	$2x10^{-6}$	NA	NA	NA	NA
Young Child Off-Site Resident:					
Inhalation of Fugitive Dust	$4x10^{-7}$	NA	NA	NA	NA
TOTAL	$4x10^{-7}$	NA	NA	NA	NA

*Calculated cancer risks are related to exposure to arsenic and/or cadmium.

NA = Not applicable; no inhalation toxicity criteria are available for the noncarcinogenic effects of the chemicals of potential concern.

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Table 11

SUMMARY OF POTENTIAL HUMAN HEALTH RISKS
Future Site Use Scenario

RECEPTOR	EXCESS LIFETIME CANCER RISK*	HAZARD QUOTIENT			
		Arsenic	Cadmium	Copper	Zinc
Long-Term On-Site Adult Worker:					
Incidental Ingestion of Soil	$7x10^{-6}$	$1x10^{-2}$	$1x10^{-3}$	$2x10^{-3}$	$7x10^{-5}$
Incidental Ingestion of Sump/Pile Material	$2x10^{-4}$	$3x10^{-1}$	$8x10^{-2}$	$3x10^{-3}$	$3x10^{-3}$
Inhalation of Fugitive Dust	$4x10^{-7}$	NA	NA	NA	NA
Ingestion of Ground Water	$2x10^{-3}$	3	1	$4x10^{-2}$	$5x10^{-2}$
TOTAL	$2x10^{-3}$	3	1	$5x10^{-2}$	$5x10^{-2}$
Short-Term On-Site Construction Worker:					
Inhalation of Fugitive Dust	$3x10^{-8}$	NA	NA	NA	NA
TOTAL	$3x10^{-8}$	NA	NA	NA	NA
Adult Off-Site Resident (West):					
Incidental Ingestion of Soil	$5x10^{-6}$	$7x10^{-3}$	$5x10^{-4}$	$2x10^{-4}$	$7x10^{-5}$
Ingestion of Homegrown Vegetables	$7x10^{-6}$	$9x10^{-3}$	$1x10^{-1}$	$3x10^{-2}$	$4x10^{-2}$
Inhalation of Fugitive Dust	$2x10^{-6}$	NA	NA	NA	NA
TOTAL	$1x10^{-5}$	$2x10^{-2}$	$1x10^{-1}$	$3x10^{-2}$	$4x10^{-2}$
Young Child Off-Site Resident (West):					
Incidental Ingestion of Soil	$1x10^{-5}$	$6x10^{-2}$	$5x10^{-3}$	$2x10^{-3}$	$2x10^{-3}$
Ingestion of Homegrown Vegetables	$7x10^{-6}$	$1x10^{-2}$	$1x10^{-1}$	$4x10^{-2}$	$5x10^{-2}$
Inhalation of Fugitive Dust	$4x10^{-7}$	NA	NA	NA	NA
TOTAL	$2x10^{-5}$	$7x10^{-2}$	$1x10^{-1}$	$4x10^{-2}$	$5x10^{-2}$
Adult Off-Site Resident (North, East, South):					
Incidental Ingestion of Soil	$7x10^{-6}$	$9x10^{-3}$	$3x10^{-4}$	$1x10^{-4}$	$3x10^{-3}$
Ingestion of Homegrown Vegetables	$9x10^{-6}$	$1x10^{-2}$	$5x10^{-2}$	$2x10^{-2}$	$4x10^{-1}$
Inhalation of Fugitive Dust	$2x10^{-6}$	NA	NA	NA	NA
TOTAL	$2x10^{-5}$	$2x10^{-2}$	$5x10^{-2}$	$2x10^{-2}$	$4x10^{-1}$
Young Child Off-Site Resident (North, East, South):					
Incidental Ingestion of Soil	$2x10^{-5}$	$9x10^{-2}$	$3x10^{-3}$	$1x10^{-3}$	$3x10^{-2}$
Ingestion of Homegrown Vegetables	$9x10^{-6}$	$1x10^{-2}$	$5x10^{-2}$	$3x10^{-2}$	$5x10^{-1}$
Inhalation of Fugitive Dust	$4x10^{-7}$	NA	NA	NA	NA
TOTAL	$3x10^{-5}$	$1x10^{-1}$	$5x10^{-2}$	$3x10^{-2}$	$5x10^{-1}$

*Calculated cancer risks are related to exposure to arsenic and/or cadmium.

NA = Not applicable; no inhalation toxicity criteria are available for the noncarcinogenic effects of the chemicals of potential concern.

exposure of humans to high levels of arsenic can produce toxic effects on both the peripheral and central nervous systems, keratosis, hyperpigmentation, precancerous dermal lesions, and cardiovascular damage.

3. Cadmium

Cadmium has been classified as a Group B1 probable human carcinogen by the inhalation pathway. Epidemiological studies have demonstrated a strong association between inhalation exposure to cadmium and cancers of the lung, kidney, and prostate. Cadmium bioaccumulates in humans, particularly in the kidney and liver. Chronic oral or inhalation exposure of humans to high doses of cadmium has been associated with renal dysfunction, bone damage, hypertension, anemia, endocrine alterations, and immunosuppression.

4. Copper

Copper is an essential element, and a daily copper intake of 2 mg is considered to be adequate for normal health and nutrition. Adverse effects in humans resulting from acute exposure to copper concentrations that exceed these recommended levels by ingestion include salivation, gastrointestinal irritation, nausea, vomiting, hemorrhagic gastritis, and diarrhea. Acute inhalation of dusts of copper salts by humans may produce irritation of the mucous membranes and pharynx, ulceration of the nasal septum, and metal fume fever (chills, fever, headache, and muscle pain).

5. Zinc

Zinc is an essential trace element that is necessary for normal health and metabolism. Exposure to zinc at concentrations that exceed recommended levels has been associated with a variety of adverse effects. Chronic and subchronic inhalation exposure to zinc has been associated with gastrointestinal disturbances, dermatitis, and metal fume fever. Chronic oral exposure to zinc may cause anemia and altered hematological parameters.

C. <u>Risk Assessment</u>

The principal threats posed by the Site are: 1) the waste piles and byproduct materials including the battery casings and piles of dusts and sludges; 2) the lead contaminated sediments in the subsurface drainage network; and, 3) the lead contaminated solids and standing water in the onsite landfill. Lower level threats include the lead and arsenic contaminated sediments in Nesquehoning and Bear Creeks, the lead contaminated soils that cover portions of the Tonolli property and a small area to the immediate west of the property boundary, and the groundwater (overburden) contaminated with arsenic, lead, and cadmium.

The sampling of Site soils found that the average concentration of lead in onsite surface soil samples was 8,300 milligrams per kilogram (mg/kg). The average lead concentration found in the waste and dust piles, byproduct materials and sump sediments was 111,000 mg/kg. The average lead concentration found in the landfill materials (solids) was 36,588 mg/kg. The average lead and arsenic concentrations found in creek sediments were 395 mg/kg and 24.8 mg/kg, respectively. The average lead (dissolved) concentration found in the overburden aquifer was 0.0277 milligrams per liter (mg/l). The average lead concentration found in soils in an area containing two residential dwellings to the immediate west of the Tonolli property boundary was 433 mg/kg.

In addition, EPA has recently identified a blood lead concentration of 10 micrograms per deciliter (ug/dl) as a level of concern for both children and adults. Using the average soil lead concentration and current biological impact models (i.e., the IU/BK model), the risk assessment estimated that >99.9% of the children residing onsite would have blood-lead above 10 ug/dl, with an average level of 82 ug/dl. The IU/BK model also estimated that 38.9% of the children residing to the immediate west of the Tonolli property boundary would have blood-lead above 10 ug/dl, with an average level of 9.0 ug/dl.

The overburden aquifer appears to be contaminated by lead, cadmium, and arsenic. Elevated lead concentrations were found only in two wells adjacent to the battery dumping and storage area and crusher building. Elevated concentrations of cadmium were found in five monitoring wells situated in the central portion of the Site, and generally downgradient from the battery processing and waste disposal areas. Arsenic at elevated concentrations was found to occur in only one well situated immediately downgradient from the onsite landfill. The elevated concentrations of dissolved metals appear to be associated with lower pH conditions.

Elevated levels of contaminants were only found to occur within the overburden aquifer at the Site. Although the overburden aquifer is not currently used for drinking water supply, EPA considered the potential for a well to be constructed within the onsite overburden in evaluating potential health risks posed by the Site conditions. Based on limited sampling of one onsite bedrock well during the later stages of the RI, no Site-related contaminants have been detected in the deep bedrock aquifer. The deep aquifer consists of the Mauch Chunk formation, and is currently used to supply drinking water to over 20,000 residents.

RISK CHARACTERIZATION SUMMARY

A summary of the total potential carcinogenic and noncarcinogenic human health risks calculated for the Site is provided in Tables

10 and 11. These tables summarize the potential risks posed by the Site if no action would be taken. When reviewing the quantitative information presented in these tables, the following threshold levels should be used. For noncarcinogenic risks, a hazard index or hazard quotient value above a value of 1.0 indicates the potential for an adverse health impact. For the carcinogenic risks, a value greater than $1x10^{-4}$ to $1x10^{-6}$ is generally recognized as indicating a risk beyond the acceptable level.

1. Noncarcinogenic Risk

The Hazard Index (HI) Method is used for assessing the overall potential for noncarcinogenic effects posed by the contaminants of concern. Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient (HQ) (or the ratio of the estimated intake derived from the contaminant concentration in a given medium to the contaminant's reference dose). HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed can be added to generate an HI value.

Tables 10 and 11 present the calculated hazard quotients for each potential receptor evaluated under both the current and future use scenarios for the Site. This table calculates HQs for reasonable maximum exposure scenarios (RME) using the exposure point concentrations calculated previously. EPA makes use of the RME calculations in assessing potential health risks posed by the Site.

Calculations demonstrate that noncarcinogenic risks may be incurred by an adult, long-term onsite worker who ingests groundwater drawn from the overburden aquifer. Elevated levels of arsenic and cadmium are the driving factors in establishing a potential noncarcinogenic risk for this pathway.

2. Carcinogenic Risks

For potential carcinogens, risks are estimated as probabilities. Excess lifetime cancer risks are determined by multiplying the exposure point concentration with the cancer potency slope and expressing the result in scientific notation. As excess lifetime cancer risk of $1x10^{-6}$ indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of Site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site.

Tables 10 and 11 present the calculated potential carcinogenic risks for each potential receptor evaluated under both the current and future use scenarios for the Site. These tables include the RME scenarios that are used by EPA in assessing potential health risks posed by the Site.

The exposure scenario which results in potential excess cancer risk greater than $1x10^{-4}$ involves ingestion of contaminated groundwater and/or contaminated waste pile and sump material by an adult long term onsite worker. Elevated levels of arsenic and cadmium are the primary factors in generating a potential carcinogenic risk for this pathway.

Several exposure scenarios result in potential excess cancer risk between $1x10^{-4}$ and $1x10^{-6}$, or the acceptable risk range. However, the majority of these scenarios assume future residential development of the Site, which is not valid. Since the most probable future use of the Tonolli Site is as an industrial facility, as supported by current zoning and planning documents, these scenarios are not considered further.

Based on the conclusions of the Risk Assessment completed for Tonolli, actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to the public health, welfare, or the environment.

3. Environmental Assessment

An ecological characterization of the Tonolli Site and an area within a 0.5 mile radius of the Site was performed during the RI/FS. Terrestrial and wetlands resources within the study area consist of deciduous forest, scrub/shrub, mixed scrub/shrub-herbaceous, and floating aquatic macrophytic plant communities. Most of the study area was found to consist of mature deciduous forest associated with the slopes of Broad Mountain to the north and Nesquehoning Mountain to the south. The other communities, including wetlands and the Nesquehoning Creek aquatic community are spread along the valley floor. There is no obvious evidence of vegetation stress due to the Site.

The Site itself is industrial land with limited vegetation present, generally situated near the edges of the property. The land surrounding the Site is largely undeveloped forest, coal spoil stockpile areas, and industrial properties. The terrestrial and wetland vegetation community types within the study area are commonly found throughout the Pocono Mountain region, and most of Pennsylvania. No plant species of special concern (state and federal listed rare, threatened, or endangered species) are recorded for the study area and none were observed during the field study.

Potential environmental receptors, or indicator species selected for the ecological evaluation included aquatic life, plants, earthworms, white-tailed deer, and shrews. An additional potential receptor identified by the Fish and Wildlife Service includes migratory passerine birds that may use the Site to feed, bathe, and use Site soils or gravel as grit. Based on the low habitat value of onsite areas, the potential for exposure of most of the species of concern was considered to be low. Exposure pathways evaluated in this assessment included: 1) direct contact of aquatic life with surface water and sediment; 2) direct contact of plants and earthworms with surface soils; 3) ingestion of surface water by white-tailed deer; and 4) ingestion of earthworms, that had accumulated heavy metals from the Site, by shrews.

Lead contamination present in the sediments and surface water may be of potential concern to aquatic life in Nesquehoning Creek. Nesquehoning Creek is designated by PADER as a Cold Water Fishery. However, habitat suitability of the creek in general has been greatly impacted by the presence of extensive amount of coal spoils in areas both upstream and downstream from the Site, and the Pennsylvania Fish Commission has reported that they are aware of the depauperate community existing there. Terrestrial species such as deer are not expected to experience any adverse impacts as a result of this exposure.

Elevated concentrations of copper and lead in surface soils onsite may have an impact on earthworms and some species of plants. Small carnivorous mammals such as shrews may also experience some adverse impacts when feeding onsite. However, the onsite area is greatly disturbed (i.e., covered by asphalt, buildings, or battery waste piles) and has a limited habitat or forage value.

4. Significant Sources of Uncertainty

The general limitations inherent in the risk assessment process as well as the uncertainty related to some of the major assumptions made in this assessment are described below.

a.) Environmental sampling and analysis error can stem from several sources including the characteristics of the matrix being sampled and systematic or random errors in the sampling and analytical methods. The following factors contribute to the uncertainty: analytical precision or accuracy, the QA/QC review of data, laboratory analysis procedures, respresentativeness of data, and proper sampling strategy.

b.) Estimation of exposure parameters includes several potential sources of uncertainty, including: estimation of exposure point concentrations, choice of exposure models, selection of input parameters used to estimate exposures, and selection of pathways for evaluation.

c.) Toxicological data error is also a large source of uncertainty in this risk assessment. The factors contributing to this are as follows;

- -Extrapolation of toxicity data from both animals to humans and from high to low doses,
- -Method used for calculating the RfD for cadmium,
- -Toxicity values used in the ecological assessment,
- -Uncertainties associated with lead toxicity (i.e., lead speciation, solubility, and bioavailability factors),
- -Uncertainties associated with use of IU/BK model at high soil lead levels.

d.) Due to the limitations of the risk assessment process itself and to conservative assumptions made specific to the Tonolli Site, the risk levels calculated are considered to be estimates of worst-case risk.

VII. SUMMARY OF REMEDIAL ALTERNATIVES

In accordance with 40 C.F.R. Section 300.430, a list of remedial response actions and representative technologies were identified and screened to meet the remedial action objectives at the Site. The technologies that passed the screening were assembled to form remedial alternatives. The FS identifed seven remedial alternatives that were determined to be the most applicable for this Site. Two cleanup levels were cited under each of the alternatives presented in the FS, however, only those citing a cleanup level of 1000 mg/kg for lead in soils are considered to be protective of human health and the environment.

It should be noted that all costs, time frames and volumes discussed below are estimates. This information will be further refined during the remedial design.

1. **Alternative 1 - No Action/No Further Action.** The National Contingency Plan (NCP) requires that EPA consider a "No Action" or "No Further Action" alternative for each site to establish a baseline for comparison to alternatives that do require action. For Tonolli, this alternative provides only for maintaining the current conditions at the Site. The existing fence would be remain, and sampling of groundwater and creek sediments would be performed quarterly for a two year period, and semi-annually thereafter for a period of 30 years.

The contaminants in the soils, battery waste piles, buildings, and sediments at the Site would be left in place, and the existing stormwater treatment plant would no longer be operated. This would allow Site contaminants to be released to the Nesquehoning Creek during major precipitation events. The Site would continue to pose a risk to trespassers, potential onsite workers, and nearby residents. In addition, continued migration of contaminants through soils, surface water, and groundwater may further impact the environment. Because this alternative will result in contaminants remaining onsite, CERCLA Section 121(c) requires that a Site review be conducted every 5 years.

- **Capital Cost:** $0
- **Annual O & M Cost (Monitoring-30 years):** $54,600
- **Present Worth Cost:** $550,000
- **Time to Implement:** N/A

There are no ARARs associated with a no action alternative.

2. **Alternative 2 - Limited Action/Institutional Controls.** This alternative consists of maintaining and operating the existing stormwater treatment system, maintaining the fence and Site security, monitoring groundwater and creek sediments, and implementing institutional controls such as deed restrictions. Such restrictions would be applied to limit the use of the Site and to prevent excavation on the Site property. Under this alternative, contamination would remain onsite and health risks to trespassers, onsite workers and nearby residents would remain at an unacceptable level.

No additional action would be taken to remove, contain, or remediate the contaminated waste/byproduct piles, battery casings, contaminated soils, sediments, onsite landfill or groundwater. Although the restriction of Site access with a security fence provides a minimal degree of protection, there is no long-term effectiveness because wastes remain onsite and exposed. The onsite treatment plant collects and treats contaminated surface water, however this action provides an insufficient reduction in toxicity, mobility, and volume of Site contaminants. State and community acceptance of this alternative is very unlikely. Because this alternative will result in contaminants remaining onsite, CERCLA Section 121(c) requires that a Site review be conducted every 5 years.

- **Capital Cost:** $0
- **Annual O & M Cost:** $277,600
- **Present Worth Cost:** $4,000,000
- **Time to Implement:** N/A

Compliance with ARARs

The operation of the onsite treatment plant will meet the substantive requirements of the National Pollutant Discharge Elimination System Requirements (NPDES) established under the Clean Water Act, 40 CFR Part 122, the Pennsylvania Wastewater Treatment Regulations (25 PA Code Sections 95.1 - 95.3), the Pennsylvania Water Quality Standards (25 PA Code Sections 93.1-93.9), and the PA Discharge Elimination System Rules, 25 PA Code, Chapter 92.

Fugitive dust emissions generated during remedial activities will comply with the National Ambient Air Quality Standards (NAAQS) set forth at 40 CFR Part 50 and 25 PA Code Sections 131.2 and 131.3. Such emissions will comply with regulations in the federally-approved State Implementation Plan for the Commonwealth of Pennsylvania, 40 CFR Part 52, Subpart NN, Sections 52.2020 - 52.2023 and in 25 PA Code Sections 123.1 and 123.2.

This Limited Action alternative would provide no remediation of the contaminated media at the Site and, therefore, would not meet the chemical-specific and action-specific ARARs discussed under Alternative 3 below.

3. **Alternative 3 - Soil Capping/Landfill Closure/Decontaminate Buildings.** Alternative 3 consists of a cap over contaminated soils, waste piles, byproduct materials and battery casings, closure of the onsite landfill in accordance with RCRA requirements, and treatment of contaminated stormwater, landfill leachate, and decontamination fluids in the onsite treatment plant prior to discharge to Nesquehoning Creek under the substantive requirements of a NPDES permit.

Under this alternative, approximately 13,000 cubic yards of battery casings, 15 cubic yards of sump sediments, 215 cubic yards of crusher building dusts, 23 cubic yards of iron oxide dust, and 39,000 cubic yards of soils contaminated above a level of 1000 mg/kg for lead would be graded and capped with a four-inch thick asphalt layer. The areas to be capped would be graded to reduce slopes and fill material would be added if needed to obtain a minimum 2 percent slope for drainage. The capped areas would be vegetated, where appropriate, to reduce erosion and infiltration and promote runoff. Ancillary surface water runoff control measures such as ditches would be applied as needed for capped areas.

Closure of the landfill consistent with the federally authorized Pennsylvania hazardous waste requirements would include dewatering the landfill through two pumping wells, placing approximately 20-30,000 cubic yards of fill material on the landfill to provide for minimum 2 percent slopes, and placing a very low permeability multilayer synthetic cap on the landfill. The existing manholes would be cleaned out and used as future leachate collection points along with dewatering well points. Prior to installing the cap, approximately 6 cubic yards of excavated stream sediments, 210 cubic yards of lagoon soils, 2,020 cubic yards of treated sludges, and 250 drums of plastic would be consolidated within the landfill. This action would be contingent upon additional sampling and characterization of the materials. Post-closure care for the landfill would include maintenance of the cap and dewatering system, and long-term groundwater monitoring of at least one upgradient and three downgradient monitoring wells. Sampling would occur quarterly for the first two years and then semi-annually thereafter.

The fence would be maintained under this alternative and nickel/iron batteries currently stored at the Site would be disposed offsite. Sediments containing greater than 450 mg/kg lead in Nesquehoning Creek and Bear Creek would be removed and placed in the existing landfill prior to capping. Onsite buildings would be decontaminated using vacuuming or washing techniques. The buildings may either be dismantled, sold or left onsite for future use. Because this alternative will result in contaminants remaining onsite, CERCLA Section 121(c) requires that a Site review be conducted every 5 years.

-Capital Cost: $ 5,130,000
-Annual Costs: $ 40,600
-Present Worth Cost: $ 6,213,000
-Time to Implement: 12 months

Compliance with ARARs

Major ARARs that will be met under this alternative include:

1) The closure of the onsite landfill will comply with the federally authorized Pennsylvania hazardous waste requirements , 25 PA Code, Chapter 264;

2) Fugitive dust emissions generated during remedial activities will comply with the National Ambient Air Quality Standards (NAAQS) set forth at 40 CFR Part 50 and 25 PA Code Sections 131.2 and 131.3. Such emissions will comply with regulations in the federally-approved State Implementation Plan for the Commonwealth of Pennsylvania, 40 CFR Part 52, Subpart NN, Sections 52.2020 - 52.2023 and in 25 PA Code Sections 123.1 and 123.2.

3) The removal of sediments from Nesquehoning and Bear Creeks will comply with the requirements of the Dam Safety and Encroachment Act of 1978, P.L. 1375, as amended, 32 P.S. 693.1 et seq., and specifically Chapter 105 (25 PA Code 105.1 et seq.). This activity will also comply with the requirements of the PA Clean Streams Law, Chapter 102 (25 PA Code 102.1 et seq.).

4) Operation of the onsite treatment plant will comply with the substantive requirements of the National Pollutant Discharge Elimination System Requirements (NPDES) established under the Clean Water Act, 40 CFR Part 122, the Pennsylvania Wastewater Treatment Regulations (25 PA Code Sections 95.1 - 95.3), the Pennsylvania Water Quality Standards (25 PA Code Sections 93.1-93.9), and the PA Discharge Elimination System Rules, 25 PA Code, Chapter 92.

5) The handling and onsite consolidation/disposal of scrap materials and drums containing plastic will comply with the federally authorized Pennsylvania waste pile requirements set forth in 25 PA Code Chapter 264.

6) The regrading and capping of materials will comply with

the requirements of the PA Soil Erosion and Sediment Control Regulations set forth in 25 PA Code, Chapter 102.

RCRA Land Disposal Restrictions (LDRs) codified at 40 CFR Part 268 are not considered to be ARARs for this Site or this alternative, specifically, the movement of contaminants within an area of contamination (AOC) for consolidation purposes during remedial activities. Given the widespread surface and shallow surface contamination at the Site, the entire Site may be considered an AOC with respect to LDRs. Movement within or consolidation of contaminants within the AOC would not constitute placement, therefore LDRs are not applicable or appropriate.

Under Alternative 3, chemical specific ARARs pertaining to groundwater, such as the Safe Drinking Water Act (Maximum Contaminant Levels (MCLs), Maximum Contaminant Level Goals (MCLGs), Secondary Maximum Contaminant Levels (SMCLs)), standards would not be met in the near term. This alternative would not comply with PADER's Ground Water Quality Protection Strategy which prohibits continued groundwater quality degradation, since the contaminated soils and wastes will remain onsite.

4. **Alternative 4 - Soil Capping/Resource Recovery/Landfill Closure/Decontaminate Buildings.** Alternative 4 consists of a cap over contaminated soils, transport of battery casings and certain waste pile/byproduct materials (iron oxide, sump sediments, and dust) to an offsite lead smelter for resource recovery, closure of the onsite landfill in accordance with the federally authorized Pennsylvania hazardous waste requirements, and treatment of contaminated stormwater, landfill leachate, and decontamination fluids in the onsite treatment plant prior to discharge to Nesquehoning Creek under the substantive requirements of an NPDES permit. Except for the resource recovery process, all activities associated with this alternative are described under Alternative 3.

Under this alternative, approximately 13,000 cubic yards of plastic and rubber battery casings, 15 cubic yards of sump sediments, 23 cubic yards of iron oxide, and 0.5 cubic yards of dust from onsite buildings would be transported to an offsite secondary lead smelter. These materials would be processed through the smelter's reverberatory and/or blast furnaces to recover lead and/or to serve as a supplementary fuel source. The battery casings may have up to 18,000 BTUs per pound and were found to contain lead at percentage levels from 1 to 10 percent. This process will operate by substituting a fraction of the normal feed material to the smelter's furnaces with the battery wastes from the Tonolli Site. The net result will be the detoxification of these materials, while providing a viable product, reclaimed lead. The smelting facility is subject to a RCRA permit for the storage and disposal of hazardous wastes and a Clean Air Act permit regulating air emissions. Because this alternative will result in contaminants remaining onsite, CERCLA Section 121(c) requires that a Site review be conducted every 5 years.

- **Capital Cost:** $ 8,290,000
- **Annual Costs:** $ 41,600
- **Present Worth Cost:** $ 9,200,000
- **Time to Implement:** 18 months

Compliance with ARARs

Major ARARs that will be met under this alternative include:

1) The closure of the onsite landfill will comply with the federally authorized Pennsylvania hazardous waste requirements , 25 PA Code Chapter 264;

2) Fugitive dust emissions generated during remedial activities will comply with the National Ambient Air Quality Standards (NAAQS) set forth at 40 CFR Part 50 and 25 PA Code Sections 131.2 and 131.3. Such emissions will comply with regulatons in the federally-approved State Implementation Plan for the Commonwealth of Pennsylvania, 40 CFR Part 52, Subpart NN, Sections 52.2020 - 52.2023 and in 25 PA Code Sections 123.1 and 123.2. In addition, the secondary lead smelting operation will comply with all applicable air emission requirements in accordance with 25 PA Code Sections 123.11 - 13 (particulate matter emissions), 25 PA Code Sections 123.21-22 (sulfur compound emissions), 25 PA Code Section 123.25 (monitoring requirements) and 25 PA Code Chapter 127, Subchapter D (Prevention of Significant Deterioration of Air Quality requirements related to sulfur dioxide emissions);

3) The removal of sediments from Nesquehoning and Bear Creeks would comply with the requirements of the Dam Safety and Encroachment Act of 1978, P.L. 1375, as amended, 32 P.S. 693.1 et seq., and specifically Chapter 105 (25 PA Code 105.1 et seq.). This activity would also comply with the requirements of the PA Clean Streams Law, Chapter 102 (25 PA Code 102.1 et seq.).

4) Operation of the onsite treatment plant would comply with the substantive requirements of the National Pollutant Discharge Elimination System Requirements (NPDES) established under the Clean Water Act, 40 CFR Part 122, the Pennsylvania Wastewater Treatment Regulations (25 PA Code Sections 95.1 - 95.3), the Pennsylvania Water Quality Standards (25 PA Code Sections 93.1-93.9), and the PA Discharge Elimination System Rules, 25 PA Code, Chapter 92.

5) The handling and onsite consolidation/disposal of scrap materials and drums containing plastic will comply with the federally authorized Pennsylvania requirements for waste piles set forth in 25 PA Code Chapter 264.

6) The regrading and capping of materials will comply with the requirements of the PA Soil Erosion and Sediment Control Regulations set forth in 25 PA Code, Chapter 102.

7) The transport and resource recovery of battery casings and wastes to an offsite secondary lead smelter will comply with 25 PA Code 261.6(a), Department of Transportation (DOT) Rules for Hazardous Materials Transport, and the federally authorized Pennsylvania requirements for hazardous waste handling and transportation, 25 PA Code Chapters 262 and 263.

8) The processing of battery casings at a secondary lead smelter will be performed at a facility permitted under 25 PA Code Chapter 265, Subchapter R, and 25 PA Code Chapter 270, in accordance with 25 PA Code Chapter 264, Subchapter O, regarding incineration, and in accordance with the applicable provisions of 40 CFR Part 266, Subpart H, regarding the handling and processing of hazardous wastes in boilers and industrial furnaces.

9) This alternative will comply with CERCLA Section 121(d)(3) and with EPA OSWER Directive #9834.11, both of which prohibit the disposal of Superfund Site waste at a facility not in compliance with Sections 3004 and 3005 of RCRA and all applicable State requirements.

RCRA Land Disposal Restrictions (LDRs) codified at 40 CFR Part 268 are not considered to be ARARs for this Site or this alternative, specifically, the movement of contaminants within an area of contamination (AOC) for consolidation purposes during remedial activities. Given the widespread surface and shallow surface contamination at the Site, the entire Site may be considered an AOC with respect to LDRs. Movement within or consolidation of contaminants within the AOC would not constitute placement, therefore LDRs are not applicable or appropriate.

Under Alternative 4, chemical specific ARARs pertaining to groundwater, such as the Safe Drinking Water Act (MCLs, MCLGs, SMCLs) standards would not be met in the near term. This alternative would not comply with PADER's Ground Water Quality Protection Strategy which prohibits continued groundwater quality degradation, since the contaminated soils and wastes will remain onsite.

5. Alternative 5 - Onsite Soil Disposal/Resource Recovery/ Landfill Closure/Decontaminate Buildings/Groundwater Treatment. Alternative 5 differs from Alternative 4 in that all soils containing lead greater than 1,000 mg/kg lead will be excavated and consolidated in the onsite landfill. Battery casings, iron oxide, sump sediments and dust will be sent offsite for resource recovery at a secondary lead smelter. Other waste piles and scrap materials will be consolidated into the landfill. Once Site soils and other materials are consolidated into the landfill, the landfill will be closed consistent with the federally authorized Pennsylvania hazardous waste requirements. Based on sampling and investigation completed during the RI/FS, EPA believes that the onsite landfill is sufficiently stable to accept additional materials (i.e., hazardous solids) generated during the remedial action. According to historical records, design drawings and sampling work completed during the RI to characterize the landfill contents and structural integrity, the landfill has sufficient additional capacity to take approximately 49,000 cubic yards of material prior to its closure. The butyl-rubber liner appears to be functioning as an effective barrier, for the landfill is currently holding approximately 2 million gallons of standing water resulting from the accumulation of precipitation over several years. Based on these factors, EPA believes that there will be no adverse effects from adding additional material to the onsite landfill.

Excavated areas where contaminated soils were removed will be sloped or backfilled with clean fill, and vegetated to provide drainage and stability. Contaminated stormwater, landfill leachate, and decontamination fluids would be treated during remediation in the existing treatment system and discharged to Nesquehoning Creek. Additional activities include the decontamination of onsite buildings using either vacuuming or washing, excavation of contaminated sediments from Nesquehoning and Bear Creeks and disposal in the onsite landfill, maintenance of the Site fence, and offsite disposal of nickel/iron batteries.

In addition to the above activities, this alternative includes limited remedial action to address the contaminated groundwater that is present in certain portions of the Site's overburden aquifer. This action would include the construction of a vertical chemical barrier (i.e., limestone filled trench) through which the groundwater would flow prior to discharge to the Nesquehoning Creek, and the discharge or injection of pH adjusted water to increase the flow rate through the limestone barrier. The barrier would be placed just north of Nesquehoning Creek and within the Site property, extending across the area of contaminant discharge to the Creek. A trench will be filled with crushed limestone, and designed to form a barrier through which all contaminated groundwater must pass before discharge to Nesquehoning Creek. Contaminated water passing through this barrier would rise in pH to a level that would effectively immobilize the dissolved metals. This groundwater action would be designed to reduce the levels of contaminants present in the overburden aquifer to background concentrations. Gradient controls would be designed to decrease cleanup time and prevent infiltration of contaminants into the bedrock aquifer, which is used for a public drinking water supply. pH adjustment of this water will be utilized to enhance the cleanup.

This alternative also includes remedial action to address the limited area of contaminated soils found to exist in a residential area to the immediate west of the Tonolli property boundary. This action includes excavation of soils containing greater than 500 mg/kg lead, collection of confirmatory samples, and backfill with clean fill and topsoil. Excavated soils would be consolidated in the onsite landfill prior to its closure. The residential area requiring this action is contiguous with the extent of soil contamination found on the Tonolli Site property. Because this alternative will result in contaminants remaining onsite, CERCLA Section 121(c) requires that a Site review be conducted every 5 years.

- **Capital Cost:** $ 11,290,000
- **Annual Cost:** $ 35,600
- **Present Worth Cost:** $ 12,310,000
- **Time to Implement:** 20 months

Compliance with ARARs

Major ARARs that will be met under this alternative include:

1) The closure of the onsite landfill will comply with the federally authorized Pennsylvania hazardous waste requirements , 25 PA Code Chapter 264;

2) Fugitive dust emissions generated during remedial activities will comply with the National Ambient Air Quality Standards (NAAQS) set forth at 40 CFR Part 50 and 25 PA Code Sections 131.2 and 131.3. Such emissions will comply with regulatons in the federally-approved State Implementation Plan for the Commonwealth of Pennsylvania, 40 CFR Part 52, Subpart NN, Sections 52.2020 - 52.2023 and in 25 PA Code Sections 123.1 and 123.2. In addition, the secondary lead smelting operation will comply with all applicable air emission requirements in accordance with 25 PA Code Sections 123.11 - 13 (particulate matter emissions), 25 PA Code Sections 123.21-22 (sulfur compound emissions), 25 PA Code Section 123.25 (monitoring requirements) and 25 PA Code Chapter 127, Subchapter D (Prevention of Significant Deterioration of Air Quality requirements related to sulfur dioxide emissions);

3) The removal of sediments from Nesquehoning and Bear Creeks would comply with the requirements of the Dam Safety and Encroachment Act of 1978, P.L. 1375, as amended, 32 P.S. 693.1 et seq., and specifically Chapter 105 (25 PA Code 105.1 et seq.). This activity would also comply with the requirements of the PA Clean Streams Law, Chapter 102 (25 PA Code 102.1 et seq.).

4) Operation of the onsite treatment plant will comply with the substantive requirements of the National Pollutant Discharge Elimination System Requirements (NPDES) established under the Clean Water Act, 40 CFR Part 122, the Pennsylvania Wastewater Treatment Regulations (25 PA Code Sections 95.1 - 95.3), the Pennsylvania Water Quality Standards (25 PA Code Sections 93.1-93.9), and the PA Discharge Elimination System Rules, 25 PA Code, Chapter 92.

5) The handling and onsite consolidation/disposal of scrap materials and drums containing plastic will comply with the federally authorized Pennsylvania waste pile requirements set forth in 25 PA Code Chapter 264.

6) The regrading and capping of materials will comply with

the requirements of the PA Soil Erosion and Sediment Control Regulations set forth in 25 PA Code, Chapter 102.

7) The transport and resource recovery of battery casings and wastes to an offsite secondary lead smelter will comply with 25 PA Code 261.6(a), Department of Transportation (DOT) Rules for Hazardous Materials Transport, and the federally authorized Pennsylvania requirements for hazardous waste handling and transportation, 25 PA Code Chapters 262 and 263.

8) The processing of battery casings at a secondary lead smelter will be performed at a facility permitted under 25 PA Code Chapter 265, Subchapter R, and 25 PA Code Chapter 270, in accordance with 25 PA Code Chapter 264, Subchapter O, regarding incineration, and in accordance with the applicable provisions of 40 CFR Part 266, Subpart H, regarding the handling and processing of hazardous wastes in boilers and industrial furnaces.

9) This alternative will comply with CERCLA Section 121(d)(3) and with EPA OSWER Directive #9834.11, both of which prohibit the disposal of Superfund Site waste at a facility not in compliance with Sections 3004 and 3005 of RCRA and all applicable State requirements.

10) Groundwater flushing activities will comply with applicable portions of regulations concerning underground injection wells established under the Safe Drinking Water Act, 40 CFR Parts 144 through 146, and administered under 40 CFR 147, Subpart NN.

11) Groundwater remediation activities will comply with applicable portions of the PADER Ground Water Quality Protection Strategy which prohibits continued groundwater degradation, and requires remediation of groundwater to background levels (25 PA Code Sections 264.90 to 264.100, specifically 25 PA Code Sections 264.97(i) and 264.100(a)(9).

RCRA Land Disposal Restrictions (LDRs) codified at 40 CFR Part 268 are not considered to be ARARs for this Site or this alternative, specifically, the movement of contaminants within an area of contamination (AOC) for consolidation purposes during remedial activities (i.e., soils, battery waste piles, stream sediments). Given the widespread surface and shallow surface contamination at the Site, the entire Site may be considered an AOC with respect to LDRs. Movement within or consolidation of contaminants within the AOC would not constitute placement, therefore LDRs are not applicable or appropriate.

6. Alternative 6 - Onsite Soil Treatment/Resource Recovery /Landfill Closure/Decontaminate Buildings/Groundwater Treatment. This alternative provides for onsite treatment of contaminated soils and battery wastes/byproducts containing more than 1,000 mg/kg lead prior to disposal in the onsite landfill. The landfill would be closed consistent with the federally authorized Pennsylvania hazardous waste requirements, and the aqueous media would be treated during construction in the existing treatment system. All remaining activities associated with this alternative are described under Alternative 5.

Two types of treatment were considered in this alternative; soil washing and solidification/stabilization. Based on treatability screenings completed during the FS for Tonolli, EPA's preferred option for soils treatment is solidification/stabilization. The soil washing technique is expected to be a slower process than onsite stabilization and one which generates a hazardous residual requiring offsite treatment and disposal. In addition, this technique was estimated to be significantly more costly than stabilization for onsite soils. Based on this analysis, EPA retained the solidification/stabilization treatment method for further consideration in remedial decision-making.

Solidification/stabilization involves excavation of soils containing greater than 1000 mg/kg lead, and stabilization of this material to remove the hazardous characteristics. The RI sampling included limited TCLP tests, which confirmed that Site soils ranging in total lead concentration from 282 mg/kg to 9,800 mg/kg exhibit hazardous characteristics for lead, as defined under RCRA. Additional sampling and testing of Site soils (TCLP or EP Toxicity) will be required to further define the volume of soils to be treated via stabilization. The treatment process involves the encapsulation of contaminated soils in cement-like materials that have a high structural integrity. Stabilization would convert the contaminated soils into a less soluble and less mobile form that meets the treatment requirements of RCRA Land Disposal Restrictions. The stabilized soils would be placed in the onsite landfill prior to its closure.

The remaining activities under this alternative include the offsite resource recovery of approximately 13,000 cubic yards of battery casings and wastes, the groundwater treatment activities including injection of pH adjusted fluids and/or a limestone barrier, remediation of contaminated soils found on the residential property to the immediate west of the Tonolli property boundary, operation of the existing treatment plant, maintenance of the Site fence, decontamination of the onsite buildings, and offsite disposal of the nickel/iron batteries. Because this alternative will result in contaminants remaining onsite, CERCLA Section 121(c) requires that a Site review be conducted every 5 years.

- **Capital Cost:** $ 22,945,000
- **Annual Cost:** $ 35,300
- **Present Worth Cost:** $ 24,179,000
- **Time to Implement:** 24 months

Compliance with ARARs

Major ARARs that will be met under this alternative include:

1) The closure of the onsite landfill will comply with the federally authorized Pennsylvania hazardous waste requirements, 25 PA Code Chapter 264;

2) Fugitive dust emissions generated during remedial activities will comply with the National Ambient Air Quality Standards (NAAQS) set forth at 40 CFR Part 50 and 25 PA Code Sections 131.2 and 131.3. Such emissions will comply with regulatons in the federally-approved State Implementation Plan for the Commonwealth of Pennsylvania, 40 CFR Part 52, Subpart NN, Sections 52.2020 - 52.2023 and in 25 PA Code Sections 123.1 and 123.2. In addition, the secondary lead smelting operation will comply with all applicable air emission requirements in accordance with 25 PA Code Sections 123.11 - 13 (particulate matter emissions), 25 PA Code Sections 123.21-22 (sulfur compound emissions), 25 PA Code Section 123.25 (monitoring requirements) and 25 PA Code Chapter 127, Subchapter D (Prevention of Significant Deterioration of Air Quality requirements related to sulfur dioxide emissions);

3) The removal of sediments from Nesquehoning and Bear Creeks will comply with the requirements of the Dam Safety and Encroachment Act of 1978, P.L. 1375, as amended, 32 P.S. 693.1 et seq., and specifically Chapter 105 (25 PA Code 105.1 et seq.). This activity will also comply with the requirements of the PA Clean Streams Law, Chapter 102 (25 PA Code 102.1 et seq.).

4) Operation of the onsite treatment plant will comply with the substantive requirements of the National Pollutant Discharge Elimination System Requirements (NPDES) established under the Clean Water Act, 40 CFR Part 122, the Pennsylvania Wastewater Treatment Regulations (25 PA Code Sections 95.1 - 95.3), the Pennsylvania Water Quality Standards (25 PA Code Sections 93.1-93.9), and the PA Discharge Elimination System Rules, 25 PA Code, Chapter 92.

5) The handling and onsite consolidation/disposal of scrap materials and drums containing plastic will comply with the federally authorized Pennsylvania waste pile requirements set forth in 25 PA Code Chapter 264.

6) The regrading and capping of materials will comply with the requirements of the PA Soil Erosion and Sediment Control Regulations set forth in 25 PA Code, Chapter 102.

7) The transport and resource recovery of battery casings and wastes to an offsite secondary lead smelter will comply with 25 PA Code 261.6(a), Department of Transportation (DOT) Rules for Hazardous Materials Transport, and the federally authorized Pennsylvania requirements for hazardous waste handling and transportation, 25 PA Code Chapters 262 and 263.

8) The processing of battery casings at a secondary lead smelter will be performed at a facility permitted under 25 PA Code Chapter 265, Subchapter R, and 25 PA Code Chapter 270, in accordance with 25 PA Code Chapter 264, Subchapter O, regarding incineration, and in accordance with the applicable provisions of 40 CFR Part 266, Subpart H, regarding the handling and processing of hazardous wastes in boilers and industrial furnaces.

9) This alternative will comply with CERCLA Section 121(d)(3) and with EPA OSWER Directive #9834.11, both of which prohibit the disposal of Superfund Site waste at a facility not in compliance with Sections 3004 and 3005 of RCRA and all applicable State requirements.

10) Groundwater flushing activities will comply with applicable portions of regulations concerning underground injection wells established under the Safe Drinking Water Act, 40 CFR Parts 144 through 146, and administered under 40 CFR 147, Subpart NN.

11) Groundwater remediation activities will comply with applicable portions of the PADER Ground Water Quality Protection Strategy which prohibits continued groundwater degradation, and requires remediation of groundwater to background levels (25 PA Code Sections 264.90 to 264.100, specifically 25 PA Code Sections 264.97(i) and 264.100(a)(9).

12) The handling and onsite treatment of soils and certain battery wastes will comply with the federally authorized Pennsylvania requirements for generators of hazardous waste, 25 PA Code Chapter 262.

13) Treatment of soils via stabilization will comply with the handling, transportation and other standards of the federally authorized Pennsylvania requirements, 25 PA Code Chapters 262, 263, and 264.

RCRA Land Disposal Restrictions (LDRs) codified at 40 CFR Part 268 are not considered to be ARARs for this Site or this alternative, specifically, the movement of contaminants within an area of contamination (AOC) for consolidation purposes during remedial activities (i.e., soils, battery waste piles, stream sediments). Given the widespread surface and shallow surface contamination at the Site, the entire Site may be considered an AOC with respect to LDRs. Movement within or consolidation of contaminants within the AOC would not constitute placement, therefore LDRs are not applicable or appropriate.

The State's Residual Waste Management Regulations, 25 PA Code Sections 287.1-299.232, are not considered to be applicable to the Tonolli Site or to the actions required by this ROD. Specifically, 25 PA Code Section 287.1 describes residual waste as certain waste, ... if it is not hazardous. Accordingly, EPA has determined that these regulations are not applicable to sites that are subject to regulations for the management or handling of hazardous waste. The waste at the Tonolli Site is hazardous and therefore, outside of the scope of the regulations. The residual waste regulations were drafted to prevent harm to the public or environment that may result from the failure to treat waste that is potentially harmful, but not "hazardous", by definition, and therefore not regulated under hazardous waste regulations. The lead-contaminated soils at levels exceeding 1000 ppm will be consolidated (before or after treatment) into the onsite landfill. This landfill will then be closed in accordance with the federally authorized Pennsylvania hazardous waste requirements. Since the PA residual waste regulations pertain to, "Garbage, refuse, other discarded material or other waste... if it is not hazardous", these regulations are neither appropriate or applicable to the hazardous materials at the Tonolli Site. See PA Code Section 287.1.

7. Alternative 7 - Offsite Soil Treatment & Disposal/Resource Recovery/Landfill Closure/Decontaminate Buildings/Groundwater treatment. This alternative differs from Alternative 6 in that soils containing greater than 1000 mg/kg lead and certain battery wastes would be shipped offsite to a permitted hazardous waste disposal facility for solidification/stabilization prior to land disposal. Limited regrading and surface water runoff control measures would be implemented around all excavated areas. The landfill would be closed consistent with the federally authorized Pennsylvania hazardous waste requirements, and the aqueous media would be treated during construction in the existing treatment system.

The remaining activities under this alternative include the offsite resource recovery of approximately 13,000 cubic yards of battery casings and wastes, the groundwater treatment activities including injection of pH adjusted fluids and/or a limestone barrier, remediation of contaminated soils found on the residential property to the immediate west of the Tonolli property boundary, operation of the existing treatment plant, maintenance of the Site fence, decontamination of the onsite buildings, and offsite disposal of the nickel/iron batteries. Because this alternative will result in contaminants remaining onsite, CERCLA Section 121(c) requires that a Site review be conducted every 5 years.

- **Capital Cost:** $ 42,750,000
- **Annual Cost:** $ 35,300
- **Present Worth Cost:** $43,760,000
- **Time to Implement:** 20 months

Compliance with ARARs

Major ARARs that will be met under this alternative include:

1) The closure of the onsite landfill will comply with the federally authorized Pennsylvania hazardous waste requirements , 25 PA Code Chapter 264;

2) Fugitive dust emissions generated during remedial activities will comply with the National Ambient Air Quality Standards (NAAQS) set forth at 40 CFR Part 50 and 25 PA Code Sections 131.2 and 131.3. Such emissions will comply with regulatons in the federally-approved State Implementation Plan for the Commonwealth of Pennsylvania, 40 CFR Part 52, Subpart NN,

Sections 52.2020 - 52.2023 and in 25 PA Code Sections 123.1 and 123.2. In addition, the secondary lead smelting operation will comply with all applicable air emission requirements in accordance with 25 PA Code Sections 123.11 - 13 (particulate matter emissions), 25 PA Code Sections 123.21-22 (sulfur compound emissions), 25 PA Code Section 123.25 (monitoring requirements) and 25 PA Code Chapter 127, Subchapter D (Prevention of Significant Deterioration of Air Quality requirements related to sulfur dioxide emissions);

3) The removal of sediments from Nesquehoning and Bear Creeks will comply with the requirements of the Dam Safety and Encroachment Act of 1978, P.L. 1375, as amended, 32 P.S. 693.1 et seq., and specifically Chapter 105 (25 PA Code 105.1 et seq.). This activity will also comply with the requirements of the PA Clean Streams Law, Chapter 102 (25 PA Code 102.1 et seq.).

4) Operation of the onsite treatment plant will comply with the substantive requirements of the National Pollutant Discharge Elimination System Requirements (NPDES) established under the Clean Water Act, 40 CFR Part 122, the Pennsylvania Wastewater Treatment Regulations (25 PA Code Sections 95.1 - 95.3), the Pennsylvania Water Quality Standards (25 PA Code Sections 93.1-93.9), and the PA Discharge Elimination System Rules, 25 PA Code, Chapter 92.

5) The handling and onsite consolidation/disposal of scrap materials and drums containing plastic will comply with the federally authorized Pennsylvania requirements for waste piles set forth in 25 PA Code Chapter 264.

6) The regrading and capping of materials will comply with the requirements of the PA Soil Erosion and Sediment Control Regulations set forth in 25 PA Code, Chapter 102.

7) The transport and resource recovery of battery casings and wastes to an offsite secondary lead smelter will comply with 25 PA Code 261.6(a), Department of Transportation (DOT) Rules for Hazardous Materials Transport, and the federally authorized Pennsylvania requirements for hazardous waste handling and transportation, 25 PA Code Chapters 262 and 263.

8) The processing of battery casings at a secondary lead smelter will be performed at a facility permitted under 25 PA Code Chapter 265, Subchapter R, and 25 PA Code Chapter 270, in accordance with 25 PA Code Chapter 264, Subchapter O, regarding incineration, and in accordance with the applicable provisions of 40 CFR Part 266, Subpart H, regarding the handling and processing of hazardous wastes in boilers and industrial furnaces.

9) This alternative will comply with CERCLA Section 121(d)(3) and with EPA OSWER Directive #9834.11, both of which prohibit the disposal of Superfund Site waste at a facility not in compliance with Sections 3004 and 3005 of RCRA and all applicable State requirements.

10) Groundwater flushing activities will comply with applicable portions of regulations concerning underground injection wells established under the Safe Drinking Water Act, 40 CFR Parts 144 through 146, and administered under 40 CFR 147,

Subpart NN.

11) Groundwater remediation activities will comply with applicable portions of the PADER Ground Water Quality Protection Strategy which prohibits continued groundwater degradation, and requires remediation of groundwater to background levels (25 PA Code Sections 264.90 to 264.100, specifically 25 PA Code Sections 264.97(i) and 264.100(a)(9).

12) The handling and offsite treatment of soils and certain battery wastes would comply with the requirements set forth in the federally authorized Pennsylvania requirements for generators of hazardous waste, 25 PA Code Chapter 262.

13) Treatment of soils via stabilization will comply with the handling, transportation and other standards of the federally authorized Pennsylvania requirements, 25 PA Code Chapters 262, 263, and 264.

RCRA Land Disposal Restrictions (LDRs) codified at 40 CFR Part 268 are not considered to be ARARs for this Site or this alternative, specifically, the movement of contaminants within an area of contamination (AOC) for consolidation purposes during remedial activities (i.e., soils, battery waste piles, stream sediments). Given the widespread surface and shallow surface contamination at the Site, the entire Site may be considered an AOC with respect to LDRs. Movement within or consolidation of contaminants within the AOC would not constitute placement, therefore LDRs are not applicable or appropriate.

VIII. COMPARATIVE ANALYSIS OF ALTERNATIVES

The seven remedial action alternatives described above were evaluated under the nine evaluation criteria as set forth in the NCP 40 CFR Section 300.430(e)(9). These nine criteria are organized according to the groups listed below:

THRESHOLD CRITERIA

- Overall protection of human health and the environment.
- Compliance with applicable or relevant and appropriate requirements (ARARs).

PRIMARY BALANCING CRITERIA

- Long-term effectiveness.
- Reduction of toxicity, mobility, or volume through treatment.
- Short-term effectiveness.
- Implementability.
- Cost.

MODIFYING CRITERIA

- Community acceptance.
- State acceptance.

These evaluation criteria relate directly to requirements in Section 121 of CERCLA, 42 U.S.C. Section 9621, which determine the overall feasibility and acceptability of the remedy.

A. Overall Protection of Human Health and the Environment.

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled, through treatment, engineering controls, and/or institutional controls.

Alternatives 5, 6 and 7 provide the highest degree of protection of human health and the environment since contaminated soils and battery wastes are consolidated and/or treated either onsite or offsite, prior to disposal. These alternatives also include groundwater remedial action, excavation of contaminated sediments, and continued operation of the onsite stormwater treatment plant. Alternatives 5, 6 and 7 would thereby eliminate, reduce, and/or control risks posed via all exposure pathways for the Site.

Alternatives 3 and 4 are also considered to be protective of human health by requiring the capping of contaminated soils and battery wastes, however future excavation at the Site may result in unnecessary exposure to contaminants remaining onsite. Alternative 2 also provides some protection of human health via the use of institutional controls; however, this would be assured only if such controls are implemented and enforced properly over the long term. No groundwater protection is offered in Alternatives 2, 3, and 4, and thus they are not considered to be protective of the environment.

Alternative 1, the No Action/No Further Action alternative, does not eliminate, reduce or control any of the exposure pathways, and it is therefore not protective of human health or the environment and will not be considered further in this analysis.

B. Compliance with ARARs.

Compliance with ARARs addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and state environmental statutes or provides a basis for invoking a waiver.

Alternatives 6 and 7 would attain all their respective Federal and state ARARs. Alternative 5 would also comply with all ARARs. Alternatives 2, 3, and 4 do not comply with federal groundwater cleanup ARARs (i.e., Safe Drinking Water Act MCLs, MCLGs, SMCLs), or applicable portions of the PADER Ground Water Quality Protection Strategy which prohibits continued groundwater quality degradation, and requires remediation of groundwater to background quality. Since Alternatives 2, 3, and 4 will not comply with groundwater cleanup ARARs, these alternatives will not be considered further in this analysis.

Major ARARS identified for this Site include:

1) The closure of the onsite landfill will comply with the federally authorized Pennsylvania hazardous waste requirements, 25 PA Code Chapter 264;

2) Fugitive dust emissions generated during remedial activities will comply with the National Ambient Air Quality Standards (NAAQS) set forth at 40 CFR Part 50 and 25 PA Code Sections 131.2 and 131.3. Such emissions will comply with regulations in the federally-approved State Implementation Plan for the Commonwealth of Pennsylvania, 40 CFR Part 52, Subpart NN, Sections 52.2020 - 52.2023 and in 25 PA Code Sections 123.1 and 123.2. In addition, the secondary lead smelting operation will comply with all applicable air emission requirements in accordance with 25 PA Code Sections 123.11 - 13 (particulate matter emissions), 25 PA Code Sections 123.21-22 (sulfur compound emissions), 25 PA Code Section 123.25 (monitoring requirements) and 25 PA Code Chapter 127, Subchapter D (Prevention of Significant Deterioration of Air Quality requirements related to sulfur dioxide emissions);

3) The removal of sediments from Nesquehoning and Bear Creeks will comply with the requirements of the Dam Safety and Encroachment Act of 1978, P.L. 1375, as amended, 32 P.S. 693.1 et seq., and specifically Chapter 105 (25 PA Code 105.1 et seq.). This activity will also comply with the requirements of the PA Clean Streams Law, Chapter 102 (25 PA Code 102.1 et seq.).

4) Operation of the onsite treatment plant will comply with the substantive requirements of the National Pollutant Discharge Elimination System Requirements (NPDES) established under the Clean Water Act, 40 CFR Part 122, the Pennsylvania Wastewater Treatment Regulations (25 PA Code Sections 95.1 - 95.3), the Pennsylvania Water Quality Standards (25 PA Code Sections 93.1-93.9), and the PA Discharge Elimination System Rules, 25 PA Code, Chapter 92.

5) The handling and onsite consolidation/disposal of scrap materials and drums containing plastic will comply with the federally authorized Pennsylvania requirements for waste piles set forth in 25 PA Code Chapter 264.

6) The regrading and capping of materials will comply with the requirements of the PA Soil Erosion and Sediment Control Regulations set forth in 25 PA Code, Chapter 102.

7) The transport and resource recovery of battery casings and wastes to an offsite secondary lead smelter will comply with 25 PA Code 261.6(a), Department of Transportation (DOT) Rules for Hazardous Materials Transport, and the federally authorized Pennsylvania requirements for hazardous waste handling and transportation, 25 PA Code Chapters 262 and 263.

8) The processing of battery casings at a secondary lead smelter will be performed at a facility permitted under 25 PA Code Chapter 265, Subchapter R, and 25 PA Code Chapter 270, in accordance with 25 PA Code Chapter 264, Subchapter O, regarding incineration, and in accordance with the applicable provisions of 40 CFR Part 266, Subpart H, regarding the handling and processing of hazardous wastes in boilers and industrial furnaces.

9) The resource recovery and offsite disposal activities will comply with CERCLA Section 121(d)(3) and with EPA OSWER Directive #9834.11, both of which prohibit the disposal of Superfund Site waste at a facility not in compliance with Sections 3004 and 3005 of RCRA and all applicable State requirements.

10) Groundwater flushing activities will comply with applicable portions of regulations concerning underground injection wells established under the Safe Drinking Water Act, 40 CFR Parts 144 through 146, and administered under 40 CFR 147, Subpart NN.

11) Groundwater remediation activities will comply with applicable portions of the PADER Ground Water Quality Protection Strategy which prohibits continued groundwater degradation, and requires remediation of groundwater to background levels (25 PA Code Sections 264.90 to 264.100, specifically 25 PA Code Sections 264.97(i) and 264.100(a)(9).

12) The handling and onsite treatment of soils and certain battery wastes will comply with the federally authorized Pennsylvania requirements for generators of hazardous waste, 25 PA Code Chapter 262.

13) Treatment of soils via stabilization will comply with the handling, transportation and other standards of the federally authorized Pennsylvania requirements, 25 PA Code Chapters 262, 263, and 264.

C. Long-term Effectiveness and Permanence.

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup levels have been met. This criterion includes the consideration of residual risk and the adequacy and reliability of controls.

Alternatives 5, 6 and 7 are the most effective and permanent remedies over the long term. Of these, Alternatives 6 and 7 provide the greatest reduction of the overall risk posed by residual contamination (i.e., any contaminants remaining onsite after remediation). The on- or offsite treatment of soils prior to disposal will significantly reduce the threat posed by contaminated materials by reducing the mobility of the contaminants. However, since soils will be consolidated in the onsite landfill in either a treated (i.e., stabilized) or untreated form, the key consideration is the long-term effectiveness and permanence of the onsite landfill as a containment unit.

Based on the evaluation of the onsite landfill during the RI, EPA believes that the existing butyl-rubber liner remains intact, and once the approximately 2 million gallons of standing water are removed, should continue to remain intact, and serve as an effective barrier from any leaching of the landfill contents into the subsurface. Added protection is provided through the upgrade of the landfill's leachate collection system, the postclosure landfill monitoring, and the implementation of the groundwater remedy. The groundwater action requires the construction of a limestone barrier that will be designed to intersect any contaminated overburden groundwater emanating from the Site. This barrier would also intersect any leachate that might migrate from the landfill into the overburden groundwater. EPA believes that the combination of remedial activities described above will serve to insure the long-term effectiveness of the landfill's use and closure.

Alternative 5 also provides for long-term effectiveness and permanence, but used containment instead of treatment to do so. The consolidation of soils prior to closure of the onsite landfill would reduce the contaminated area at the Site to one-third of its original extent. Closure of the onsite landfill using a multilayer cap is a highly reliable containment method for preventing direct contact with the contents and significantly reducing or eliminating any leaching of landfill contaminants into deeper soils or groundwater beneath the landfill. Under this alternative, the soils would remain untreated prior to consolidation, and thus the proper construction and maintenance of the landfill cap and monitoring network is critical to preventing future exposure. The engineering controls (i.e., landfill closure) required for this alternative are highly reliable, and will provide for long-term effectiveness and permanence, as long as they are properly maintained.

D. Reduction of Toxicity, Mobility & Volume Through Treatment.

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies a remedy may employ.

Alternatives 6 and 7 provide the greatest reduction in toxicity and mobility because they include the treatment of approximately 39,000 cubic yards of contaminated soils. The stabilization process would increase material volume by approximately 20%, but reduce toxicity and mobility. The soil washing process was not retained for further consideration based on the significantly higher cost, reduced implementation time, and comparable performance to the stabilization treatment method in meeting the reduction of toxicity, mobility and volume through treatment criteria.

Alternative 5 reduces the toxicity and volume of contaminated solids since approximately 13,000 cubic yards of battery wastes containing the highest lead concentrations would be sent offsite for resource recovery at a secondary lead smelter. Alternative 5 does not require treatment of contaminated soils, but instead uses closure of the landfill in accordance with RCRA to contain the soil contamination, therefore reducing the mobility.

E. Short-Term Effectiveness.

Short-term effectiveness refers to the period of time needed to complete the remedy and any adverse impacts on human health and the environment that may be posed during the construction and implementation of the remedy until cleanup levels are achieved.

Alternatives 5 and 7 are estimated to be implemented with the shortest duration and least complexity. Alternative 6 utilizes more complex technologies and treatment equipment for a longer period of time, thereby increasing short-term risks to onsite workers. Alternative 7 requires additional materials handling and truck transport of approximately 39,000 cubic yards of contaminated soils to an offsite treatment and disposal facility. This activity would require over 3,900 trucks to leave the Site with contaminated soils and travel to a treatment/disposal facility, thereby increasing the chance of accident and subsequent contact with contaminated soils.

Each alternative involves earth moving activity which would result in the generation of dust. Thus, dust control measures must be implemented and air monitoring must be performed to reduce the chance of offsite migration of contaminants.

F. Implementability.

Implementability considers the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the action.

Each alternative is implementable and utilizes readily available and reliable technologies. Alternatives 5 and 7 are the least complex in terms of the technical and administrative feasibility. Alternative 5 would be the most implementable of those alternatives incorporating media treatment.

Alternatives 5 through 7 include offsite actions which would require administrative coordination. Alternative 6 utilizes relatively new technologies, and field conditions might delay completion or reduce the effectiveness of this alternative.

G. Cost.

CERCLA requires selection of a cost-effective remedy that protects human health and the environment and meets the other requirements of the Statute. Project costs include all construction and operation and maintenance costs incurred over the life of the project. Capital costs include those expenditures necessary to implement a remedial action.

The costs of the seven alternatives range from $ 0 to $ 43,760,000. The degree of protection provided by the alternatives also varies. Comparison of different levels of cost for different levels of protectiveness and permanence of treatment technologies is a primary decision criterion in this evaluation.

Alternatives 6 and 7 are the highest in cost due to the use of additional treatment technologies for soils prior to either onsite or offsite disposal. These alternatives may also be considered to offer a somewhat higher degree of long-term effectiveness and permanence since they include the stabilization of soils.

The cost of implementing Alternative 5 is lower, but reflects the consolidation of contaminated soils in the onsite landfill without treatment. This alternative offers approximately the same degree of protection as Alternatives 6 and 7, due to the use of the onsite landfill to contain either treated or untreated soils.

H. Community Acceptance.

The July 18, 1992 Proposed Plan and July 28, 1992 public meeting produced a small number of comments from the general public and an extensive amount of technical comments from a local water authority, and from a group of potentially responsible parties (PRPs) for the Site. Responses to these comments appear in the Responsiveness Summary section of this ROD.

I. State Acceptance.

The Commonwealth of Pennsylvania has not concurred with this selected Remedial Action.

IX. SELECTED REMEDY

<u>Modified Alternative 6 - Onsite Soil Treatment and Disposal/Resource Recovery/ Landfill Closure/Decontaminate Buildings/Groundwater Treatment.</u>

A. EPA has selected a modified version of Alternative 6 as the remedy for the Site. This modified remedy differs from the Preferred Alternative described in the July 18, 1992 Proposed

Plan in the trigger level that will be used to define those soils which pose a principal threat and that require treatment prior to consolidation in the onsite landfill. The modified remedy also differs from the Proposed Plan Preferred Alternative in the estimated cost for remediation. The modified remedy combines certain features (i.e., handling of contaminated Site soils) of Alternative 5 with Alternative 6. This modified remedy was selected based on EPA's consideration of new information and extensive comments submitted during the public comment period. This topic is discussed in Section XI of the ROD (Explanation of Significant Changes).

EPA's selected remedy, Modified Alternative 6, requires active treatment, or onsite stabilization for soils defined as a principal threat (i.e., soils containing greater than 10,000 mg/kg lead - one order of magnitude greater than the cleanup level), prior to the consolidation of treated soils in the onsite landfill. Passive treatment, including the addition of agricultural limestone to the landfill after consolidation of soils posing a lower level threat (i.e., soils containing lead at levels between 1,000 mg/kg and 10,000 mg/kg), will provide in-situ pH adjustment to protect from potential future leaching of metals from the soils.

This modified approach to soils treatment provides an equivalent level of protection and long-term effectiveness as the originally proposed remedy, while being somewhat more cost-effective. Modified Alternative 6 represents the best balance among the evaluation criteria and satisfies the statutory requirements of protectiveness, compliance with ARARs, cost effectiveness, and the utilization of permanent solutions and treatment to the maximum extent practicable. EPA believes that this combination of treatment to address the principal threats and engineering controls (i.e., containment) to address lower level threats will effectively reduce and eliminate the potential risks posed by the Site. The major components of the selected remedy include the following:

1) Offsite transport and treatment of approximately 13,000 cubic yards of battery wastes, including battery casings, iron oxide, sump sediments, and dust via resource recovery at a secondary lead smelter. Additional sampling and characterization of other waste pile materials (i.e., crusher building dusts) will be conducted to confirm whether these materials can also be treated effectively via this process. Similarly, excavation of all sediments and battery fragments in stormwater collection piping and onsite sumps will be completed, and these materials will be characterized to determine whether they can be processed via resource recovery, or consolidated within the onsite landfill.

2) Excavation of all soils with lead contamination above 1000 mg/kg (approximately 39,000 cubic yards), and backfill and

grading for excavated onsite areas. Consolidation of all soils with lead contamination ranging from 1000 mg/kg to 10,000 mg/kg within the onsite landfill. Onsite stabilization of all soils posing a principal threat with lead contamination above 10,000 mg/kg (approximately 7,300 cubic yards), and consolidation of treated soils in the onsite landfill. Excavation of soils situated to the immediate west of the property boundary containing greater than 500 mg/kg lead, collection of confirmatory samples, and consolidation of soils in the onsite landfill, and backfill the area with clean soil. Additional sampling will be completed prior to excavation to define the area and volume of soils potentially impacted by the Site activities and requiring remediation.

3) Consolidation and, if necessary, treatment of approximately 2,020 cubic yards of treated sludges, approximately 250 drums of melted plastic, and approximately 210 cubic yards of excavated lagoon soils in the onsite landfill prior to closure. Additional sampling will determine whether the lagoon soils and drums can be consolidated in the onsite landfill.

4) Additional sampling and completion of bioassays for contaminated sediments in Bear and Nesquehoning Creeks will be completed during remedial design to develop appropriate cleanup levels for this medium. Once an appropriate cleanup level for sediments has been approved by EPA, in consultation with PADER, all sediments above the approved cleanup level will be excavated from the creek(s) and consolidated within the onsite landfill.

5) Closure of the onsite landfill in accordance with the federally authorized Pennsylvania (RCRA) hazardous waste requirements, including; removal of standing water from the landfill, upgrade of the leachate collection system, consolidation of materials generated during the remedial action within the landfill to meet the minimum grading requirements, application of a properly designed layer of agricultural limestone, and cover of the landfill with a cap having a permeability of less than $1x10^{-7}$ cm/sec. The addition of a layer of crushed or pulverized limestone shall be designed to prevent potential future leaching of lead from the consolidated soils to the onsite landfill. A treatability study will be completed to evaluate the optimal application rate of agricultural limestone to provide the maximum pH buffering capacity to the consolidated soils for this in-situ passive treatment method. Post-closure care of the landfill will include maintenance of the cap and dewatering system, and construction and routine sampling of a groundwater monitoring network for a 30 year period.

6) Approximately 2 million gallons of landfill leachate (standing water), decontamination fluids generated during remediation, and approximately 16 million gallons per year of contaminated stormwater will be collected and treated using the existing

treatment system prior to discharge to Nesquehoning Creek. Monitoring data collected from the treatment system will be used by EPA in consultation with the State to determine appropriate discharge levels in compliance with the substantive requirements of the NPDES program.

7) Treatment of contaminated overburden groundwater via construction of a vertical chemical barrier (i.e., limestone trench), with possible injection of pH adjusted water to enhance groundwater flow rates. Gradient controls will be used to prevent infiltration of contaminants into the bedrock aquifer. Monitoring of the effectiveness of the vertical chemical barrier and/or injection of pH adjusted fluids, and monitoring of the bedrock aquifer beneath the Site will be completed.

8) Decontamination of Site buildings via either vacuuming or washing, including dismantling of non-structural components and removal of equipment and debris which may inhibit thorough decontamination.

9) Offsite disposal of drained nickel/iron batteries.

10) Maintenance of Site fence and Site security, as needed, to limit trespassing and access to the Site during construction.

11) Air monitoring during onsite activity.

12) During the course of the remedial action, and the excavation and construction phase, measures will be taken to prevent runoff of surface waters, sediments, and/or contaminated soils or battery wastes from entering Nesquehoning or Bear Creeks.

13) Evaluation of the onsite underground storage tanks will be completed during remedial design. Any tanks that may impede the completion of the selected remedy, specifically the excavation of contaminated soils, will be addressed during remediation.

14) Institutional controls, in the form of deed restrictions will be placed on the deeds to the parcel(s) that comprise the onsite landfill to limit the use of this land and prevent excavation or construction on the capped and closed landfill. Additional deed restrictions will be implemented to limit the use of the Site to industrial use only.

Some changes may be made to the remedy as a result of the remedial design and construction process. Such changes, in general, reflect modifications resulting from the engineering design process. If required, EPA may issue an Explanation of Significant Differences (ESD) or an amendment to the ROD to document any major changes in the remedy.

B. PERFORMANCE STANDARDS

(1) Resource Recovery of Battery Wastes

The entire volume of battery casings presently stored on the surface of the Site (approximately 13,000 cubic yards) shall be transported to a secondary lead smelter for treatment via resource recovery. Approximately 23 cubic yards of iron oxide, 15 cubic yards of sediments excavated from the onsite drainage network (sumps), and approximately 0.5 cubic yards of dust collected during decontamination of onsite buildings will also be transported to the offsite smelter for processing via resource recovery. Additional sampling and characterization of other waste pile materials (i.e., crusher building dusts) will be conducted to confirm whether these materials can also be treated effectively via this process. All sediments and battery fragments in stormwater collection piping and onsite sumps shall be excavated, and these materials will be characterized to determine whether they can be processed via resource recovery, or consolidated within the onsite landfill. The performance standard for the characterization and processing shall be that the material will be tested for its lead content and, if feasible, taken to the resource recovery facility for processing.

The potential for use of rail transport for the resource recovery action shall be evaluated during remedial design. The final transport method to be used for this portion of the remedial action is subject to EPA approval, in consultation with PADER prior to implementation.

If it is determined that rail transport is not viable, the materials transported offsite shall be placed in trucks lined with plastic and covered with tarps prior to leaving the Site to prevent wind dispersion of the materials. All vehicles used to transport the contaminated battery casings will be washed down before leaving the Site to minimize the spread of contamination to presently non-contaminated areas away from the Site.

(2) Excavation, Treatment and Consolidation of Soils

All soils containing greater than 1000 mg/kg lead (approximately 39,000 cubic yards) shall be excavated from onsite areas. Additional sampling shall be completed to define the areal extent and volume of soils exceeding the cleanup level and the target level for treatment. Soil excavation will continue until all soils over the cleanup level of 1000 mg/kg have been removed. Those soils identified as a principal threat, that is exceeding 10,000 mg/kg of lead, shall be treated onsite using stabilization. Stabilization requires treatment with a cementitious or pozzolanic reagent mixture developed specifically to bind the metal constituents within the stabilizer matrix. Treatability testing of the stabilized matrix will be performed to determine the stabilizing mixture needed to pass the toxicity test of less than 5 mg/liter of lead. After being treated to pass the toxicity test, the stabilized soils will be consolidated in the onsite landfill.

Remaining soils (i.e., those soils containing lead at concentrations between 1000 mg/kg and 10,000 mg/kg) will be consolidated in the onsite landfill prior to its closure. Post excavation sampling will be completed to confirm that soil cleanup levels have been met.

Additional sampling shall be conducted on residential property to the immediate west of the property boundary to confirm the extent of Site-related contamination. All soils containing greater than 500 mg/kg lead in the residential area shall be excavated and consolidated in the onsite landfill with the remaining untreated soils. The soils will be handled in a manner consistent with Standard #2 above. Post excavation sampling will be completed to confirm that soil cleanup levels have been met. All excavated areas will be backfilled with clean fill material and regraded to confirm with the original topography of the property. Filled areas will also be vegetated.

(3) Miscellaneous Solids and Debris

Approximately 2,020 cubic yards of treated sludges presently stored in the onsite smelter building shall be consolidated in the onsite landfill prior to its closure. Approximately 250 drums of melted plastic remaining from Tonolli's recycling operation and approximately 210 cubic yards of lagoon soils excavated during EPA's previous removal action will also be consolidated within the onsite landfill prior to closure. Additional sampling shall be completed to determine whether the lagoon soils pose a principal threat, that is a lead concentration greater than 10,000 mg/kg. If the lagoon soils contain greater than 10,000 mg/kg lead, they will be treated onsite via stabilization prior to consolidation within the landfill. If the debris materials (i.e., drums) pass the TCLP or EP Toxicity test for lead, they may be disposed of in an offsite landfill. If the debris materials fail the TCLP or toxicity test, the drums will be either transported offsite for treatment and disposal in accordance with LDR standards, or they will be consolidated in the onsite landfill.

(4) Sampling and Excavation of Sediments

Additional sampling and characterization of impacted sediments and surface water in Bear and Nesquehoning Creeks shall be completed during remedial design. Bioassays, preferably using Hyallela azteca, shall be completed to determine an appropriate cleanup level for creek sediments. Once a sediment cleanup level is established, subject to the approval of EPA in consultation with PADER, all sediments exceeding this level will be excavated from Bear and Nesquehoning Creeks and consolidated in the onsite landfill. Sediments will be removed by either hand excavation or by using hydraulic vacuums.

(5) Closure of Onsite Landfill

The onsite landfill shall be closed in accordance with the federally authorized Pennsylvania RCRA hazardous waste requirements. The capping and closure of the landfill shall include pumping the standing water out of the landfill (treating in onsite treatment system - see Standard #6), removing all materials present within the existing manholes and upgrading the landfill manholes to be used as future leachate collection points, placing fill material to meet minimum grading requirements, and placing a very low permeability multilayer synthetic cap on the landfill. The landfill cap shall be designed to have a permeability of less than $1x10^{-7}$ cm/second. In lieu of fill material, the treated (stabilized) and untreated soils, and debris discussed under items 2 and 3 above may be consolidated in the landfill prior to capping. In addition, a layer of crushed or pulverized limestone shall be spread and tilled over the clean fill layer placed on the landfill during closure. A treatability study will be completed in remedial design to evaluate the optimal application rate of agricultural limestone to provide maximum pH buffering capacity to the consolidated materials.

Post-closure care shall include routine inspection and maintenance of the cap, the dewatering system and the leachate collection system for a 30 year period. Maintenance shall include repairs to the landfill cap as necessary to maintain the permeability standard, correct any breaches, or any effects of settling, subsidence or erosion, and the cultivation of natural vegetation on the cap to prevent erosion. An operation and maintenance plan for the landfill cap will be required, and is subject to the approval of EPA in consultation with PADER.

Long-term groundwater monitoring, as required by the federally authorized Pennsylvania RCRA requirements for landfill closure (25 PA Code Chapter 264), and as set forth in a landfill monitoring plan is subject to the approval of EPA in consultation with PADER. A monitoring network for the landfill shall be constructed and maintained for a period of 30 years. Sampling of the landfill monitoring wells will occur quarterly for the first two years until a database is built and then semi-annually thereafter.

(6) Operation of Stormwater Treatment System

The existing stormwater treatment system shall be operated and maintained to effectively reduce contaminant levels prior to the discharge of treated water to Nesquehoning Creek. Approximately 2 million gallons of landfill leachate (standing water), decontamination fluids generated during remediation, and approximately 16 million gallons per year of contaminated stormwater will be collected and treated using the existing system. Monitoring data collected from the treatment system over the past year will be used by EPA, in consultation with the State to determine acceptable discharge levels in accordance with the substantive requirements of the NPDES program.

The treatment plant will continue to be operated and maintained for the duration of the remediation. From the monitoring data, EPA, in consultation with PADER will determine a clean up level for the storm water influent (i.e., surface water flowing across Site into treatment system). Semi-annual monitoring of the storm water influent shall be performed. EPA, in consultation with PADER, will review the semi-annual monitoring to determine if further treatment of storm water influent will be required. If, at any time, the monitoring confirms that the clean up levels of the influent have been attained, and remain at the required levels for eight consecutive quarters, treatment may be suspended.

(7) Shallow Groundwater Remediation

The overburden groundwater shall be remediated to reduce the levels of contaminants and to prevent the migration of contaminants to the deep bedrock aquifer, which is used as a drinking water supply. An evaluation of the most effective and timely method for achieving the groundwater cleanup levels will be conducted during remedial design. An appropriate method to achieve the cleanup levels is subject to the approval of EPA, in consultation with PADER. The groundwater remediation shall achieve the background levels for the contaminants in the overburden groundwater, which is the performance standard. This requirement is set forth in the PA Hazardous Waste Management Regulations, where it is required that all groundwater must be remediated to "background" quality as specified by 25 PA Code Sections 264.90-264.100, specifically PA Code Sections 264.97(i) and (j) and Section 264.100(a)(9).

The background concentrations for each contaminant of concern shall be established in accordance with the procedures for groundwater monitoring outlined in 25 PA Code Section 264.97 before groundwater treatment begins. The background concentrations to be established during remedial design are subject to the approval of EPA, in consultation with PADER.

A vertical chemical (limestone) barrier shall be constructed at a point through which all potential Site affected groundwater must pass before discharge to the Nesquehoning Creek. Additional details will be required to be developed during remedial design to establish proper criteria for determining the optimal depth, thickness, and length of this barrier. The selected method for achieving the cleanup levels for groundwater is subject to the approval of EPA, in consultation with PADER. On a preliminary basis, it is anticipated that the groundwater remediation will include the construction of a vertical limestone barrier extending for approximately 1,100 feet from onsite monitoring well 16 to monitoring well 15. The barrier will extend eastward to a point that would intersect groundwater flowing under the onsite landfill. The barrier will consist of permeable crushed limestone placed in an approximately 20 foot trench that would extend from approximately 10 feet below the water table to approximately two feet above the water table.

In order to decrease the time for all impacted aquifer water to be treated by the limestone barrier, injection, or flushing of pH adjusted fluids into wells situated upgradient from the barrier shall be considered. Additional evaluation of this process, and collection of pertinent groundwater data shall be conducted during remedial design to consider the overall effectiveness of implementing both approaches for shallow groundwater remediation. The selected method or combination of remedial methods for the groundwater treatment is subject to the approval of EPA, in consultation with PADER.

Monitoring of the effectiveness of the groundwater treatment method(s) shall be conducted by constructing monitoring wells onsite and in offsite areas, downgradient from the vertical barrier and Nesquehoning Creek. This monitoring network will be capable of determining whether the limestone barrier is effectively removing Site-related contaminants from the shallow groundwater. An operation and maintenance plan for the groundwater treatment method and monitoring network shall be required. The performance of the groundwater treatment system shall be carefully monitored on a regular basis and the system may be modified, as determined by EPA, based upon the performance data collected during operation. If, at any time, sampling confirms that background levels have been attained through the overburden aquifer and remain at the required levels for twelve consecutive quarters, monitoring may be suspended.

It may become apparent during implementation or operation of the groundwater treatment system, that contaminant levels have ceased to decline and are remaining constant at levels higher than the Performance Standards over some portion of the Site. If EPA and the Commonwealth of Pennsylvania determine that implementation of the selected remedy demonstrates, in corroboration with hydrogeological and chemical evidence, that it will be technically impracticable to achieve and maintain the Performance Standards throughout the entire area of groundwater contamination, EPA and the PADER may require that any or all of the following measures be taken, as further modifications of the existing system:

- Long-term gradient control may be provided by low level pumping, as a containment measure;
- Chemical-specific ARARs may be waived for those portions of the aquifer for which EPA and PADER determine that it is technically impracticable to achieve further contaminant reduction;
- Institutional controls may be provided to restrict access to those portions of the aquifer where contaminants remain above Performance Standards; and
- Remedial technologies for groundwater restoration may be re-evaluated.

The decision to invoke any or all of these measures may be made during the 5-year reviews of the remedial action. If such a decision is made, EPA will amend the ROD or issue an Explanation of Significant Differences.

(8) Decontamination of Onsite Buildings

Decontamination of Site buildings via either vacuuming or washing, including dismantling of non-structural components and removal of equipment and debris which may inhibit thorough decontamination. If the buildings are dismantled, the debris material will be managed in accordance with RCRA.

(9) Offsite Disposal of Drained Nickel/Iron Batteries

The 10 1,000-pound nickel/iron batteries shall be transported from the Site to an offsite landfill for disposal.

(10) Site Fence

The Site perimeter fence and security shall be maintained to prevent trespassing and access to the Site during construction. The fence shall be maintained for 30 years.

(11) Air Monitoring

Air monitoring shall be completed during onsite activity. The air monitoring shall be designed to monitor the contaminants of concern for the Site and total suspended particulates. The air monitoring shall assure the health and safety of the workers and nearby residents from exposure to site and remediation generated contaminants.

(12) Surface Water Runoff Controls

During the course of the remedial action, and the excavation and construction phase, measures shall be taken to prevent runoff of surface waters, sediments, and/or contaminated soils or battery wastes from entering Nesquehoning or Bear Creeks. Runoff control measures shall effectively collect any water, dust, or other solids generated during decontamination or remedial activities in such a way as to prevent offsite migration of these materials.

(13) Underground Storage Tanks

Additional evaluation of the onsite underground storage tanks will be completed during remedial design. Any tanks that may impede the completion of the selected remedy, specifically the excavation of contaminated soils, will be addressed during remediation.

(14) Deed Restrictions

Restrictions shall be placed in the deed to the Site to prohibit excavation or construction of any kind on the approximate 10 acre area comprised by the onsite landfill. Additional deed restrictions will be implemented to limit the use of the Site to industrial use only.

XI. STATUTORY DETERMINATIONS

Section 121 of CERCLA requires that the selected remedy:

- be protective of human health and the environment;
- comply with ARARs;
- be cost-effective;
- utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and
- address whether the preference for treatment as a principal element is satisfied.

A description of how the selected remedy satisfies each of the above statutory requirements is provided below.

Protection of Human Health and the Environment.

The selected remedy for the Site will be protective of human health and the environment by reducing the principal threats posed by the Site. The selected remedy uses treatment technologies to address the principal threats, engineering controls to contain the lower level threats, and institutional controls to enforce and support the containment portion of the remedy. Potential health risks posed by the Site through viable exposure pathways (i.e., direct contact, ingestion of waste piles, contaminated soils, sediments, ingestion of contaminated groundwater, and inhalation of contaminated dusts) will be eliminated and controlled by the remediation selected in this ROD.

The selected remedy requires the use of offsite resource recovery to address the battery casings and other high lead content materials. Soils that pose a principal threat, that is exceeding 10,000 mg/kg of lead, will be excavated and treated onsite via stabilization to immobilize the contaminants prior to consolidation of the treated soils in the onsite landfill. Remaining soils posing a lower level threat will be consolidated in the onsite landfill using agricultural limestone as a passive, in-situ treatment method to reduce mobility of the contaminants. Closure of the onsite landfill in accordance with the federally authorized Pennsylvania (RCRA) hazardous waste requirements will prevent exposure to these materials, and significantly reduce or eliminate any leaching of contaminants into soils or groundwater. Shallow groundwater will be treated as it flows through a limestone barrier placed onsite, and monitoring will be instituted to verify the effectiveness of this system and to monitor water quality in the bedrock aquifer.

Compliance with Applicable or Relevant and Appropriate Requirements.

These standards are considered applicable to this action:

The closure of the onsite landfill will comply with the federally authorized Pennsylvania (RCRA) hazardous waste requirements, 25 PA Code Chapter 264.

Fugitive dust emissions generated during remedial activities will comply with the National Ambient Air Quality Standards (NAAQS) set forth at 40 CFR Part 50 and 25 PA Code Sections 131.2 and 131.3. Such emissions will comply with regulatons in the federally-approved State Implementation Plan for the Commonwealth of Pennsylvania, 40 CFR Part 52, Subpart NN, Sections 52.2020 - 52.2023 and in 25 PA Code Sections 123.1 and 123.2. In addition, the secondary lead smelting operation will comply with all applicable air emission requirements in accordance with 25 PA Code Sections 123.11 - 13 (particulate matter emissions), 25 PA Code Sections 123.21-22 (sulfur compound emissions), 25 PA Code Section 123.25 (monitoring requirements) and 25 PA Code Chapter 127, Subchapter D (Prevention of Significant Deterioration of Air Quality requirements related to sulfur dioxide emissions.

The removal of sediments from Nesquehoning and Bear Creeks will comply with the requirements of the Dam Safety and Encroachment Act of 1978, P.L. 1375, as amended, 32 P.S. 693.1 et seq., and specifically Chapter 105 (25 PA Code 105.1 et seq.). This activity would also comply with the requirements of the PA Clean Streams Law, Chapter 102 (25 PA Code 102.1 et seq.).

Operation of the onsite treatment plant will comply with the substantive requirements of the National Pollutant Discharge Elimination System Requirements (NPDES) established under the

Clean Water Act, 40 CFR Part 122, the Pennsylvania Wastewater Treatment Regulations (25 PA Code Sections 95.1 - 95.3), the Pennsylvania Water Quality Standards (25 PA Code Sections 93.1-93.9), and the PA Discharge Elimination System Rules, 25 PA Code, Chapter 92.

The handling and onsite consolidation/disposal of scrap materials and drums containing plastic would comply with the federally authorized Pennsylvania (RCRA) requirements for waste piles set forth in 25 PA Code Chapter 264.

The regrading and capping of materials will comply with the requirements of the PA Soil Erosion and Sediment Control Regulations set forth in 25 PA Code, Chapter 102.

The resource recovery of battery casings and wastes at an offsite secondary lead smelter will comply with 25 PA Code 261.6(a), Department of Transportation (DOT) Rules for Hazardous Materials Transport, and the federally authorized Pennsylvania (RCRA) requirements for hazardous waste handling and transportation, 25 PA Code Chapters 262 and 263.

The processing of battery casings at a secondary lead smelter will be performed at a facility permitted under 25 PA Code Chapter 265, Subchapter R, and 25 PA Code Chapter 270, in accordance with 25 PA Code Chapter 264, Subchapter O, regarding incineration, and in accordance with the applicable provisions of 40 CFR Part 266, Subpart H, regarding the handling and processing of hazardous wastes in boilers and industrial furnaces.

The resource recovery and offsite disposal activities will comply with CERCLA Section 121(d)(3) and with EPA OSWER Directive #9834.11, both of which prohibit the disposal of Superfund Site waste at a facility not in compliance with Sections 3004 and 3005 of RCRA and all applicable State requirements.

Groundwater flushing activities will comply with applicable portions of regulations concerning underground injection wells established under the Safe Drinking Water Act, 40 CFR Parts 144 through 146, and administered under 40 CFR 147, Subpart NN.

Groundwater remediation activities will comply with applicable portions of the PADER Ground Water Quality Protection Strategy which prohibits continued groundwater degradation, and requires remediation of groundwater to background levels (25 PA Code Sections 264.90 to 264.100, specifically 25 PA Code Sections 264.97(i) and 264.100(a)(9).

The handling and onsite treatment of soils and certain battery wastes will comply with the federally authorized Pennsylvania requirements (RCRA) for generators of hazardous waste, 25 PA Code Chapter 262.

Treatment of soils via stabilization will comply with the federally authorized Pennsylvania hazardous waste requirements for handling, transportation and other standards at 25 PA Code Chapters 262, 263, and 264.

The additional sampling and evaluation of an appropriate cleanup level for contaminated sediments will be completed in accordance with the requirements of the Fish and Wildlife Coordination Act, 16 U.S.C. Section 661, et. seq.

These standards are considered relevant and appropriate to this action:

Onsite treatment will comply with the federally authorized Pennsylvania (RCRA) regulations and standards for owners and operators of hazardous waste treatment, storage and disposal facilities, in accordance with 25 PA Code Chapter 264, Subchapters A-E, Subchapter I (containers), and Subchapter J (tanks).

This alternative will comply with 25 PA Code Chapter 264, Subchapter F, regarding groundwater monitoring.

Contamination in the groundwater will be reduced to background levels as required by 25 PA Code Sections 264.90-264.100, specifically 25 PA Code Section 264.97(i) and 264.100(a)(9). If implementation of the Selected Remedy demonstrates, in corroboration with hydrogeological and chemical evidence, that it will not be possible to meet the remediation goals and it is thus technically impracticable to achieve and maintain background concentrations throughout the shallow aquifer, then EPA, in consultation with PADER, may amend the ROD or issue an Explanation of Significant Differences to inform the public of alternative groundwater goals.

The following are to be considered during this action:

This alternative will comply with EPA OSWER Directive #9834.11 which prohibits the disposal of Superfund Site waste at a facility not in compliance with Section 3004 and 3005 of RCRA and all applicable State requirements.

Determinations about the effectiveness of soil remediation at the Site will be based on EPA 230/02-89-042, Methods for Evaluating Cleanup Standards, Vol. I: Soils and Solid Media.

The following are not considered to be applicable to this action:

RCRA Land Disposal Restrictions (LDRs) codified at 40 CFR Part 268 are not considered to be ARARs for this Site or the action required by this ROD, specifically the movement of contaminants within an area of contamination (AOC) for consolidation purposes during remedial activities (i.e., soils, battery waste piles, stream sediments). Given the widespread surface and shallow surface contamination at the Site, the entire Site may be considered an AOC with respect to LDRs. Movement within or consolidation of contaminants within the AOC would not constitute placement, therefore LDRs are not applicable or appropriate.

The State's Residual Waste Management Regulations, 25 PA Code Sections 287.1-299.232, are not considered to be applicable to the Tonolli Site or to the actions required by this ROD. Specifically, 25 PA Code Section 287.1 describes residual waste as certain waste, if it is not hazardous. Accordingly, EPA has determined that these regulations are not applicable to sites that are subject to regulations for the management or handling of hazardous waste. The waste at the Tonolli Site is hazardous and therefore, within the universe of sites that are subject to the regulations governing the handling of hazardous waste. The residual waste regulations were drafted to prevent harm to the public or environment that may result from the failure to treat waste that is potentially harmful, but not "hazardous", by definition, and therefore not regulated under hazardous waste regulations. The lead-contaminated soils at levels exceeding 1000 ppm will be consolidated (before or after treatment) into the onsite landfill. This landfill will then be closed in accordance with the federally authorized Pennsylvania hazardous waste requirements. Since the PA residual waste regulations exempt from regulation, "Garbage, refuse, other discarded material or other waste... if it is not hazardous", these regulations are neither appropriate or applicable to the hazardous materials present at Tonolli. See PA Code Section 287.1.

Cost Effectiveness

The estimated present worth cost for the selected remedy is $ 16,616,000. The remedy is cost-effective in mitigating the risks posed by the principal threats at the Site in a reasonable time and meets all other requirements of CERCLA. Site materials containing the highest concentrations of inorganic contaminants will be treated on (stabilization) or offsite (resource recovery) to reduce toxicity and mobility. Stabilized soils will be consolidated in the onsite landfill prior to closure. Contaminated soils posing a lower level threat will be consolidated in the onsite landfill using a passive in-situ treatment method to reduce the mobility and prevent migration of contaminants. After consolidation of treated and untreated materials, the onsite landfill will be properly closed in accordance with RCRA standards. This combination of treatment and engineering controls effectively reduces and eliminates the potential risks posed by the Site in a cost-effective manner.

The selected remedy provides a high degree of long-term effectiveness and permanence. This remedy is judged to afford overall effectiveness proportional to its cost such that the remedy represents a reasonable value.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable.

The selected remedy utilizes permanent solutions and treatment technologies to the maximum extent practicable while providing the best balance among the other evaluation criteria. Of all alternatives evaluated, the selected remedy provides the best balance in terms of long-term effectiveness and permanence, reduction of toxicity, mobility or volume through treatment, cost, implementability, and community acceptance.

The criteria that were most critical in the selection of the remedy were overall protection of human health and the environment, long-term effectiveness and permanence, and reduction of toxicity, mobility, or volume through treatment. Because EPA anticipates that the Site will be used for industrial purposes after the cleanup is completed, the permanence and long-term effectiveness of the remedy were of critical concern. The selected remedy will effectively reduce the contaminated area at the Site to one-third of its original extent, and minimize the operation and maintenance requirements for the remedial activities.

The selected remedy meets the statutory requirement to utilize permanent solutions and treatment technologies to the maximum extent practicable. Treatment has been selected to address the Site materials and contaminated media posing the principal threats to human health and the environment. Four of the six categories of contaminated wastes or environmental media will be subject to treatment under this remedy. Engineering controls (i.e., containment- landfill closure) have been selected to complement the treatment methods, as well as to contain treated materials, and certain untreated materials that pose lower level threats.

Preference for Treatment as a Principal Element

The selected remedy satisfies the statutory preference for remedies that employ treatment as a principal element to permanently reduce the volume, toxicity, or mobility of hazardous substances. By removing the battery casings and wastes containing the highest lead concentrations for offsite resource recovery, treating onsite soils which pose a principal threat via stabilization prior to consolidation in the onsite landfill, and treating surface water and groundwater to remove contaminants before it is discharged back into the environment, the selected remedy employs treatment as a principal element.

XI. EXPLANATION OF SIGNIFICANT CHANGES

The Proposed Plan identifying EPA's preferred alternative for the Tonolli Corporation Site was released for comment in July 1992. The selected remedy described in this ROD differs from the remedy in the Proposed Plan with regard to the following:

1) During the public comment period, new information indicated that EPA's remedial action objectives and health-based cleanup levels could be met by an alternate approach to treating contaminated Site soils. This information also indicated that such an alternate approach to soils treatment would provide for a more cost-effective remedy to permanently and effectively address the Site conditions. Based on an evaluation of this new information, EPA selected a different trigger level that will be used to define those soils which pose a principal threat and that require treatment prior to consolidation in the onsite landfill. This modification serves to combine certain features (i.e., handling of contaminated Site soils) of Alternative 5 with Alternative 6, as they appeared in the July 18, 1992 Proposed Plan.

The modified Alternative 6 requires the treatment of contaminated soils defined as a principal threat (i.e., soils with lead levels exceeding 10,000 mg/kg, or one order of magnitude greater in concentration than the cleanup level) via onsite stabilization prior to consolidation in the onsite landfill. This approach requires treatment of approximately 7300 cubic yards of soils containing the highest total lead concentrations. Remaining soils (i.e., soils containing lead between 1000 and 10,000 mg/kg) will be consolidated in the onsite landfill, in combination with a more passive treatment method designed to significantly reduce potential for leaching of any contaminants. A layer of crushed or pulverized agricultural limestone will be added to the onsite landfill as part of the cap construction and landfill closure.

This modified remedy provides an equivalent level of protection and long-term effectiveness as the originally proposed remedy, while being more cost-effective. EPA believes that this combination of treatment and engineering controls will effectively reduce and eliminate the potential risks posed by the Site in as permanent a manner as the originally proposed remedy.

2) The estimated present worth cost for this modified version of Alternative 6 is $16,616,000. This figure for modified Alternative 6 includes an estimated cost for remediation of Site groundwater via the construction of a vertical chemical barrier, and the flushing of pH adjusted fluids to decrease the treatment duration. This groundwater cost information was not entirely

provided in the Feasibility Study Report, but EPA collected supplemental information which is available in the Administrative Record for Tonolli. The cost of the preferred alternative described in EPA's Proposed Plan did not include these estimated groundwater costs, nor did any of the other alternatives presented therein.

3) The estimated time to implement Modified Alternative 6 is 25 months. This implementation time differs from that cited under the preferred alternative in EPA's Proposed Plan by one month.

4) The soils excavated from a residential area situated to the immediate west of the Tonolli property boundary will be consolidated in the onsite landfill prior to its closure, rather than treated onsite via stabilization.

5) Additional sampling and bioassays will be conducted to determine an appropriate cleanup level for the contaminated sediments that have been detected in Bear and Nesquehoning Creeks. Based on comments received from the U.S. Department of Interior, Fish and Wildlife Service, EPA has deleted the reference of a 450 mg/kg sediment cleanup level for lead that was included in the Preferred Remedy described in the Proposed Plan.

XII. RESPONSIVENESS SUMMARY

This Responsiveness Summary for the Tonolli Corporation Superfund Site is divided into the following sections:

SECTION I Overview
The overview summarizes the public's response to remedial (cleanup) alternatives listed in the Proposed Remedial Action Plan (Proposed Plan). The Proposed Plan outlined various methods of cleanup of the Tonolli Corporation Superfund Site (the Site) and discusses EPA's preferred method.

SECTION II Background on Community Involvement
The Background section reviews the history of community interest in the Site and identifies the concerns expressed during the remedial planning activities at the Tonolli Corporation Site.

SECTION III Summary of Major Comments and Questions Received During the Public Meeting and EPA Responses
This section documents comments and questions from citizens and potentially responsible parties, as well as comments offered by an attorney for the Lansford-Coaldale Joint Water Authority during the July 28, 1992 Public Meeting in Nesquehoning. These comments and questions and EPA's responses are categorized by topic.

SECTION IV Summary of Major Comments and Questions Received During the Public Comment Period and EPA Responses
This section documents comments and questions received in writing by EPA during the Public Comment period, and EPA's responses.

I. Overview

The Proposed Plan for the Tonolli Corporation Superfund Site was issued on July 18, 1992. EPA's public comment period for the Site was originally scheduled to run from July 18, 1992 through August 18, 1992. This comment period was extended an additional 30 days in response to a timely request. EPA conducted a public meeting on July 28, 1992 to present the Proposed Plan to the public. At this meeting, the public was given an opportunity to ask questions and to comment on the cleanup alternatives outlined in the Proposed Plan and the results of the Remedial Investigation for the Site. The comments and EPA's responses are documented in Section III of this document. In general, the public supported EPA's Preferred Alternative to cleanup the Tonolli Corporation Superfund Site. Concern was raised, however, about the future use of the Site and the onsite treatment of the contaminants. These concerns are addressed herein.

II. Background on Community Involvement

The Tonolli Corporation Superfund Site is located in Nesquehoning, Pennsylvania, which is approximately four miles west of Jim Thorpe, Pennsylvania. Jim Thorpe is a local hub of tourism within the popular Poconos region of Pennsylvania. Nesquehoning is primarily a residential community, but it has several industrial facilities located in an industrial park in the western end of the Borough.

Citizens in Nesquehoning and the surrounding areas have a high awareness of Superfund sites because there are four of these sites in a 20 mile radius of Nesquehoning. Residents have been direct in voicing their concerns about area industries polluting the environment.

EPA held its first public meeting in November 1989 to discuss ongoing cleanup activities at the Tonolli Corporation Superfund Site. Media coverage has been minimal for the Site. There were approximately 40 people at the meeting. Approximately the same number of people attended the most recent meeting held in July 1992. Many of the attendees of the first meeting were also members of the Anthracite Regional Conservation Society, which is a local environmental advocacy group. There was some local television coverage and several articles appeared in the local newspapers.

The comments and questions received by EPA revealed that the public was most concerned with the long-term effectiveness of EPA's preferred alternative and the onsite treatment of the contaminated ground water and soil. Also, the public was interested in any future plans for the Site.

III. Summary of the Major Comments and Questions Received During the Public Meeting and EPA Responses

<u>EPA's Preferred Alternative</u>

1. How does the chemical barrier trench work to extract the contaminants from the groundwater?

EPA RESPONSE: The contaminants migrate with the ground water flow in the alluvial aquifer. As the ground water flows toward Nesquehoning Creek (i.e., downgradient), it will pass through the chemical barrier. The limestone will increase the pH of groundwater passing through it, thereby allowing the contaminants to precipitate out of the water remaining trapped in the limestone area.

2. Is the proposed water treatment process considered a new solution? Where has this solution been successfully implemented?

EPA RESPONSE: The solution is considered to be new. A similar solution was used in the western part of the United States where there are a significant number of lead mines. It has also been proposed for use at another lead battery Superfund site in Pennsylvania called Brown's Battery.

3. Would you explain the stabilization process?

EPA RESPONSE: The stabilization process involves adding differing proportions of cement-like material to the soil to contain the contamination within a rigid structure that will not break down over many years.

4. Has the stabilization process been successful in the past?

EPA RESPONSE: The stabilization technology is applied to most of the battery recycling Superfund sites. It is considered state-of-the-art technology for currently operating lead smelting plants. It is a proven technology.

5. Is EPA going to locate the buildings and equipment which were bought and relocated from the Site? Will this procedure be included in the preferred remedy?

EPA RESPONSE: EPA contacted the bankruptcy trustee and the liquidator to obtain a record of items sold from the Site. EPA may, in its enforcement discretion, seek to further ascertain the location of such buildings and equipment; however, this task is not a component of the ROD for the Tonolli Site.

6. Will the soil that goes into the landfill have lower concentrations of contaminants as a result of the solidification process?

EPA RESPONSE: No, the concentration of the contaminants will not change; however, the mobility of these contaminants and their potential to adversely affect human health or the environment will be significantly decreased.

7. How long will it take before the contaminants are released from the solidified material due to deterioration?

EPA RESPONSE: The solidified material will be placed in the landfill, which will be capped. The cap will protect the solidified material from accelerated deterioration through weathering. In addition, the remedy selected in this ROD requires the addition of a layer of agricultural limestone to the landfill to further reduce the potential for contaminants to leach or migrate. The landfill will also be monitored and maintained for a 30-year period.

8. How long will EPA monitor the Site area?

EPA RESPONSE: EPA will require monitoring of the Site for a 30-year period. Because contaminants will remain in the onsite landfill, technical reviews will be completed every 5 years to verify that this remedy remains protective.

9. There was concern that the monitoring would not last forever and the solidified materials would break down, thereby causing recontamination of the Site. It was suggested that EPA lower the concentration levels of the contaminants in the solidified material. It was requested that EPA take some of the contaminants out of the soil regardless of the costs.

EPA RESPONSE: EPA also considered another technology discussed in the Proposed Plan called soil washing. This involves washing the contamination out of the soil. EPA indicated at the meeting that the Agency would welcome any comments or indication of preference for one technology over another.

As is described in Section VII of the ROD, EPA's preferred option for soils treatment is solidification/stabilization. This preference is based on the results of evaluating each remedial technology and alternative against the nine criteria set forth in the NCP. Based on treatability tests completed during the RI/FS, EPA determined that the soil washing technique did not perform as well as stabilization in the implementability, short-term effectiveness and cost-effectiveness criteria. After consideration of this information, EPA selected stabilization as the most effective treatment technique for contaminated soils.

10. Who makes the final decision on the selected remedy for the Site besides EPA and the public? Do the potentially responsible parties have any input?

EPA RESPONSE: The final decision on the selection of a remedy is made by the Regional Administrator at EPA, Region III. EPA also seeks the concurrence of the Commonwealth of Pennsylvania on the selection of a remedy. In addition, EPA considers all public input before making the final decision, including any comments submitted by any PRPs associated with the Site.

11. Why did EPA choose alternative #6 over alternative #7 as the preferred alternative in the July 18 Proposed Plan?

EPA RESPONSE: The costs to implement alternative #7 are almost twice as much as alternative #6, yet it provides no further risk reduction. In addition, alternative #7 transfers the risk to another location while creating additional risk to workers and nearby residents from large amounts of truck traffic (i.e., approximately 3,000 trucks). Based on EPA's balancing of the different evaluation criteria for the alternatives, EPA determined that alternative #6 provided the same level of overall risk reduction for the Site cleanup, and poses a lower risk to nearby residents and workers during completion. Alternative #6 was also preferred due to the lower cost.

12. Will the water treatment plant be used to process contaminated water from other Sites?

EPA RESPONSE: No. The stormwater treatment system will remain at the Site throughout the cleanup.

13. Based on the need to process some of the excavated soils in a lead smelter, does EPA plan to construct one onsite?

EPA RESPONSE: No. EPA intends to use an offsite lead smelter to process the contaminated battery casings.

14. What will have to be transported offsite by truck?

EPA RESPONSE: The contaminated battery casings will be transported offsite for this treatment. The operation would span a one and a half year period with a frequency of about five trucks per week. EPA will require research of the possibility for transporting the casings by train prior to the intiation of this activity.

The Remedial Investigation

15. Is it possible that in the past 18 years contamination from the Site has migrated offsite with the onsite groundwater?

EPA RESPONSE: Yes. There are contaminants in the groundwater which have flowed and are flowing toward Nesquehoning Creek. The seeps found along the creek bank and sampled during the RI/FS represent shallow groundwater that has migrated, carrying Site-related contaminants to an offsite area. Implementation of the remedy described in the ROD will address all contaminated shallow groundwater.

16. Was a health impact study done to test children for lead levels in their blood? If so, did the test results show any high concentrations?

EPA RESPONSE: There were seven children from the immediate Site vicinity tested for blood lead levels. None of the children showed concentrations of lead in blood that exceeded the level of concern. The test results can be found in the Administrative Record.

17. Where does EPA get the background levels that are referenced in the Proposed Plan, and who determines what background is?

EPA RESPONSE: Background is defined through a series of sampling activities conducted in areas that have not been affected by the Site. The idea is to determine the conditions which pre-date contamination at the Site. A range of background concentrations is developed from the numerous samples taken. During the RI/FS, over 50 offsite soil samples were collected and analyzed to determine the background level for lead in soils at and around the Tonolli Site.

To determine background levels for groundwater, EPA drilled wells in ten different locations. Sampling results taken from monitoring wells situated upgradient of the Site and in the natural forested area were considered to represent background levels for groundwater. EPA, in consultation with the Pennsylvania Department of Environmental Resources (PADER), approves the background levels and ranges for a specific site.

18. Why does the soil contamination stop at the fence line on the northern boundary of the Site?

EPA RESPONSE: The primary contributing factor lies in the soil differences between the Site and the wooded area north of the Site, and the significant change in topography (surface elevation) that occurs along the fence line to the north of the Site. Because the Site was built on coal spoils and fly ash, the basic chemistry and lead content of this material is significantly different than the native soils found in the wooded area.

19. In an initial permit issued upon the proposal of the Panther Creek cogeneration plant, it indicated that "Bank C", an area delineated as potential fuel source material on Panther Creek's surface mining permit, had high levels of lead and sulfuric acid. Why don't those levels still appear?

EPA RESPONSE: EPA is not aware of the referenced first draft of the permit for the Panther Creek facility. However, based on data collected and reviewed by EPA, and the Panther Creek permit application and supplemental information collected for Banks C & D, Bank C does not appear to have been impacted by Site contaminants.

20. Has the lead contamination from the Site impacted wildlife?

EPA RESPONSE: EPA conducted an Environmental Assessment of the Site which indicated that Site contamination did not significantly impact wildlife.

21. Why would there be an increased impact for humans walking on

the Site, but not wildlife?

EPA RESPONSE: In the Environmental Assessment, risks to wildlife were evaluated based on certain exposure scenarios. Since most of the Site is paved, and does not present a suitable habitat or food source, most exposure to wildlife would occur for a very limited amount of time. The evaluation of potential human health risks looked at trespassers and adult onsite workers, both scenarios where a longer duration of exposure to Site contaminants could be expected to occur. Due to the longer duration of exposure for human receptors, the potential health risks to humans are somewhat greater.

22. How many wells were drilled? And when?

EPA RESPONSE: Twenty monitoring wells were drilled and constructed at the Site between May 1990 and December 1990. One additional bedrock well was drilled and constructed in March 1992. Further information may be found in the Administrative Record.

23. Did EPA compare data from Tonolli Corporation monitoring wells and EPA monitoring wells?

EPA RESPONSE: EPA reviewed the data collected from the Tonolli Corporation monitoring wells in planning the activities associated with the RI/FS. EPA was unable to use these wells for its study because many of them were filled in with silt and others were inaccessible.

24. Were there higher concentrations of lead and cadmium when the Tonolli Corporation was monitoring its wells?

EPA RESPONSE: Yes, based on a rough evaluation of data from Tonolli Corporation's records, there were, in general, higher concentrations of lead and cadmium detected.

25. What company did Tonolli hire to conduct the monitoring?

EPA RESPONSE: Based on records available from EPA and PADER's files, some monitoring work was conducted by Motley Engineering. Since with the quality of the groundwater samples collected by Tonolli was questionable, other than the historical air monitoring information, EPA did not make use of Tonolli Corporation's monitoring data to complete the analysis of the Site.

26. How often did EPA test the monitoring wells?

EPA RESPONSE: The wells were sampled twice--in two different seasons. Both filtered and unfiltered samples were collected from the monitoring wells.

27. What was the concentration of contaminants in 1991 when the water table was low, and in 1992 when the water table was high?

EPA RESPONSE: All monitoring well sampling associated with the RI/FS was completed during late 1990 and early 1991. One additional bedrock well was constructed and sampled in March 1992. Since only one well was sampled in 1992, and it was a bedrock well unlike the remaining wells, EPA cannot make a general comparison of contaminant levels present in Site groundwater in 1991 versus 1992.

Site Usage

28. When the Site is cleaned up, how will it be classified?

EPA RESPONSE: The Site will be cleaned up to a level that will allow for an industrial operation to be located there. The landfill area will be closed to use. There will be a restriction placed on the deed to this portion of land to prevent any excavation or building of any kind.

29. Will the Site be used for a hazardous waste landfill in the future?

EPA RESPONSE: EPA has no knowledge of a hazardous waste landfill ever being placed onsite.

30. Will any material from the Tonolli coal refuse pile (Bank C) be processed at the "combustion plant" which is operating near the Site? Is there any possibility of monitoring the stacks at the plant?

EPA RESPONSE: Based on a review of sampling data collected during the RI/FS and by Panther Creek Partners during their permit application process, it appears that there are no Tonolli contaminants present in Bank C. Bank C, as it is designated in Panther Creek's surface mining permit application, is not part of the Tonolli Site property.

EPA also believes that the Panther Creek cogeneration plant is required, by its permit, to conduct regular monitoring of its air emissions.

Public Participation

31. Will EPA continue to hold public meetings when it starts the cleanup?

EPA RESPONSE: EPA will remain in contact with the local officials on Nesquehoning Borough Council. If there is a desire on the part of the community for more meetings, EPA will schedule as many as necessary to update the community on current activities at the Site.

Potentially Responsible Parties

32. Only 50 of the 500 potentially responsible parties (PRPs) have come forward to be accountable for the cost of the cleanup. What happened to the other 450 potentially responsible parties?

EPA RESPONSE: Only approximately 50 PRPs came forward to agree to conduct the RI/FS at the Site. The PRPs identified for this Site, except for those parties who have settled with EPA under the recent de minimis settlement, will be contacted and requested to participate in the next phase of response work, or the remedial design and remedial action of the remedy selected in this ROD. Once the Record of Decision is finalized, EPA will notify the remaining potentially responsible parties of the cleanup work that is required for the Site and costs due to the United States. EPA will first ask them to implement the remedy; if there is no response, EPA may then require action by the potentially responsible parties. If the potentially responsible parties continue to resist, EPA will pursue the matter in court for recovery of any money spent by EPA on the Site.

33. How many potentially responsible parties has EPA taken to court since the start of the Superfund program?

EPA RESPONSE: EPA does not have an exact number of cost recovery cases. However, EPA is very active in pursuing cost recovery in a large number of cases across the country.

34. Who holds the title to the land at the Tonolli Site?

EPA RESPONSE: The ownership of the property is under control of a court-appointed bankruptcy trustee (an attorney in Pottsville, Pennsylvania).

35. Who owned the property before the bankruptcy trustee?

EPA RESPONSE: Tonolli Corporation.

36. Is the property returned to the original owner once it is cleaned up?

EPA RESPONSE: Yes, typically the property returns to the original owner. In this case, the original owner, Tonolli Corporation, no longer exists.

Site History

37. What measures did EPA and PADER take to control toxic emissions from Tonolli Corporation while it was still operating?

EPA RESPONSE: Prior to 1979, Tonolli Corporation received a permit from PADER for the discharge of treated waters. In 1980, hazardous waste regulations were issued under the Resource Conservation Recovery Act (RCRA). At that time, Tonolli Corporation was required to notify EPA that it was handling hazardous waste. In August 1980, Tonolli Corporation notified EPA and qualified for interim status under the RCRA regulations.

Tonolli Corporation submitted the first part of an application for a full hazardous waste permit to PADER and EPA. Tonolli Corporation never received a full permit for hazardous waste handling because there were matters of non-compliance, such as the scope and frequency of its groundwater monitoring. The files show a significant amount of correspondence between PADER, EPA and Tonolli regarding notices of violation and non-compliance matters. There were numerous Site inspections by PADER and EPA which showed evidence of contamination in onsite areas. EPA continued to request compliance from Tonolli Corporation until it filed for bankruptcy.

38. Comment - Throughout the public meeting there were several comments made concerning the effectiveness of the Superfund program. There was a perception that the potentially responsible parties make the final decision on the selected remedy. A comment was made that the potentially responsible parties should all pay an equal amount regardless of the cost of the cleanup.

EPA RESPONSE: See EPA's response to comment number 10.

Comment and Questions Presented by the Lansford-Coaldale Joint Water Authority

39. The Water Authority drilled and sampled two wells immediately west of the Site. A study indicating the presence of volatile organic compounds was forwarded to EPA. To what extent did EPA address--in the Proposed Plan--the potential health risks associated with these contaminants?

The study also showed that if the Water Authority were to pump 800,000 gallons of water per day from their supply wells, that this may result in drawing potentially contaminated ground water from under the Site. Does the Proposed Plan addresses this issue?

EPA RESPONSE: Over 300 samples were collected during the RI/FS at Tonolli. This sampling identified five metals (arsenic, cadmium, copper, lead, zinc) as the contaminants of major concern for evaluating health risks posed by the Site. Volatile organic compounds were only detected in onsite soils at very low levels, and only in eight locations. The locations where these compounds were detected in soils tended to coincide with Tonolli's main operations area, in the central portion of the Site. No volatile organic compounds were detected in onsite groundwater.

The ground water contamination found at the Tonolli Site is restricted to a specific area where batteries were broken open, and acid from the batteries was introduced to the soils. Lead, cadmium, and arsenic were dissolved in the battery acid, and thus transported into Site soils, and eventually groundwater. This contamination is currently found only in the overburden aquifer beneath the main operations area of the Site. The sample results revealed no contamination was found in the deep or shallow bedrock aquifer that the Water Authority uses for a water supply. EPA has selected a groundwater remedy that should be effective in removing Site-related contaminants from the overburden aquifer. EPA has also required further evaluation of a two-part groundwater cleanup approach to expedite this action to the maximum extent possible. Furthermore, EPA has taken the Water Authority's volume of water usage into account by proposing long-term monitoring as part of EPA's preferred remedy.

40. Did EPA consider the likelihood of the Water Authority increasing its pumping of water to a million gallons per day when determining the effectiveness of the groundwater treatment outlined in the Proposed Plan?

EPA RESPONSE: The Water Authority's concerns would be considered in designing the groundwater treatment system and the monitoring network associated with verifying the effectiveness of this cleanup technique. EPA is proposing a two-part scenario for the treatment of the groundwater. The primary mechanism is the installation of a chemical barrier, which is a trench filled with limestone constructed downgradient of the Site. The limestone will increase the pH of groundwater passing through it, thereby allowing the contaminants to precipitate out of the water remaining trapped in the limestone area. In addition, EPA will require the evaluation of using pH adjusted water to enhance the flow of groundwater through the barrier, thus increasing the effectiveness of this technique and reducing the time needed to remediate all contaminated overburden groundwater. EPA's groundwater cleanup action for Tonolli will focus on removing contaminants from the overburden aquifer while monitoring both the effectiveness of this technique and the water quality in the bedrock aquifer beneath the Site. EPA does not anticipate that the potential increased pumping of groundwater from the bedrock aquifer via the Authority's supply wells will impede the proper completion of this action.

41. The Water Authority is concerned that the two wells which it drilled and sampled are within the area where contaminated soils exist. The Water Authority plans to implement a well system which would draw water from the area where the affected soils are located.

EPA RESPONSE: The Authority's supply wells are located at a significant distance from the impacted area (i.e., extent of soils contamination) comprised by the Tonolli Site. The monitoring wells constructed by the Authority along the western property boundary of the Tonolli Site may lie within an area where contaminated soils exist, however these monitoring wells are not likely to be used as supplemental water supply wells. To date, EPA has not found a direct correlation between contaminated soils and contaminated groundwater. There are many areas of the Site that have contaminated soils to an approximate three-foot depth, but that do not show contaminants in monitoring wells. The contaminants have been present in the Site soils for many years, and have not migrated to a great extent, as EPA has seen with other lead contaminated sites. The only areas where lead has been detected in the groundwater is where the actual battery-breaking operations occurred.

In addition, based on EPA's review of technical information and pump test reports submitted by the Authority, there does not appear to be conclusive evidence that, under extreme pumping conditions, the Authority's supply wells would draw water from the overburden aquifer of concern beneath the Tonolli Site. The Authority's supply wells are presently drawing water from the bedrock aquifer, or the Mauch Chunk formation. EPA has not found any Site-related contamination to be present in the bedrock aquifer beneath the Site.

IV. Summary of the Major Comments and Questions Received During the Public Comment Period and EPA Responses

Groundwater Concerns

42. Comments submitted by the Lansford-Coaldale Joint Water Authority stated that EPA did not consider technical groundwater data provided by the Authority, and that the proposed cleanup for the Tonolli Site does not provide for adequate protection of the water authority's well water supply system.

EPA RESPONSE: EPA disagrees with the assertions made by the local water authority, and contends that all relevant groundwater information has been considered in selecting a protective response action for contaminated groundwater at the Tonolli Site. This information is contained within the Administrative Record for the Site.

EPA reviewed several groundwater investigation reports submitted by the local water authority, and determined that the assertions made regarding the potential for contaminants present in Site groundwater to impact the authority's supply wells are based on inconclusive, and in some cases, inappropriate data. The three major concerns expressed by the authority are addressed below.

The Authority's monitoring wells are upgradient from the Tonolli Site, and therefore groundwater contamination that may migrate from the Site would not readily effect these wells. In addition, the contamination (i.e., lead) reported to be present in the Authority's monitoring wells situated adjacent to the Site was detected as a result of inappropriate sampling techniques, and does not represent the contaminants of concern at the Tonolli Site that would be most likely to migrate through the subsurface. EPA's review of the limited sampling data also shows that the levels of metals found in the Authority's monitoring wells falls within the statistical range for background in the Site area.

EPA required the collection of both filtered and unfiltered samples at the Tonolli Site in order to evaluate the fate and transport tendencies for the contaminants of concern (heavy metals) because of the natural turbid conditions of the overburden aquifer. Based on a comparison of these sampling results, EPA determined that metals are most likely to migrate through groundwater in dissolved form. EPA has defined a limited extent of shallow groundwater contamination at the Site. This contamination was detected using filtered groundwater samples. The limited area of impact does not include the Authority's wells. Without sampling data that can be used for comparison to the Site conditions, the Authority's assertion that contamination is present in their monitoring wells remains inconclusive.

EPA disagrees with the Authority's conclusion that, under extreme pumping conditions, their water supply wells will pull contamination from the Tonolli Site into their public water supply. EPA reviewed technical information submitted by the authority, including a Groundwater Supply Investigation completed by Applied Geotechnical and Environmental Service Corporation (AGES) in September 1987. The results of this investigation do not conclusively indicate that the monitoring wells adjacent to the Tonolli Site are within the "cone of depression" (i.e., area effected by the withdrawal of groundwater at a specific pumping location) of the Authority's production wells. EPA's review showed that, following the end of the Authority's long-term pump test, the monitoring wells adjacent to Tonolli did not respond in a manner indicative of being within the pumping wells' cone of depression. Water levels in the monitoring wells next to the Site did not recover when the pump test ended. In fact, the water levels actually continued to decline. All other monitoring wells showed immediate water level gains when the pumping wells were turned off. The reports provided by the Authority do not provide sufficient data to explain this discrepancy in water level recovery. In addition, the Authority's investigation did not include long-term water level measurements for before and after the pump test in order to determine other local influences on water levels. Without this additional information, the conclusion that the drawdown seen in the monitoring wells adjacent to the Site was directly caused by pumpage of the Authority's production wells can not be made.

EPA also disagrees with the Authority's comment that leaving soils in place at levels up to 1000 ppm lead will result in continuing groundwater contamination. EPA believes that the 1000 ppm cleanup level for Site soils will be protective of groundwater. Of all the contaminants of concern for the Site, lead is the least mobile, and least likely to be transported through the soils and into the groundwater. Under certain conditions, lead may be transported as suspended particles, or in a dissolved form (i.e., in solution) under extreme conditions. During the RI/FS, dissolved lead was only found in groundwater in areas downgradient from the battery breaking and processing areas at Tonolli. EPA believes that this lead was introduced into the groundwater through its dissolution in battery acid. EPA did not detect dissolved lead at elevated levels in groundwater in areas of the Site that had lead in soil greater than 1000 ppm, and that are upgradient of the battery breaking and processing areas. In addition, elevated levels of lead in soils were generally found to occur in only the upper three feet. The general trend for lead in soils was a decrease in concentration with depth. This data indicates that lead levels in soil, far greater than the 1000 ppm cleanup level, have not impacted groundwater in most of the Site area. Therefore, EPA believes that the soil cleanup level of 1000 ppm for lead is protective of groundwater.

43. One commentor stated that the Proposed Plan is technically flawed because it does not accurately describe the hydrogeologic conditions at the Site, and it requires cleanup of groundwater, which is not necessary. This commentor also stated that the Administrative Record (i.e., Feasibility Study Report) for Tonolli contains data that conclusively demonstrates that the bedrock aquifer is under artesian pressure, and that therefore EPA cannot claim that any groundwater remediation of the surficial aquifer is required.

EPA **RESPONSE:** EPA disagrees that the Proposed Plan is technically flawed because it does not provide a detailed description of the hydrogeological characteristics of the Site. As required by the National Contingency Plan (NCP), the Proposed Plan summarizes the information relied upon to select the preferred alternative. Such a summary does not provide the level of detail needed to describe the specific hydrogeological characteristics. The Proposed Plan states that the primary references for detailed information are the RI/FS Reports and the Administrative Record file for this Site.

EPA disagrees with the commentor's assertion that the Feasibility Study contains data that conclusively demonstrates that the bedrock aquifer beneath the Site is under artesian pressure. The RI/FS data shows that artesian conditions were found (i.e., confined or semi-confined) to occur only in the one bedrock well. These conditions have not been shown to exist across the entire Tonolli Site. EPA's correspondence of January 21, 1992, wherein the Agency accepted as final the revised RI Report, clearly states EPA's position on the artesian conditions, as follows:

"Artesian conditions that may be present in the fractured bedrock do not necessarily indicate a lack of connection between the alluvial and bedrock aquifers across the entire Tonolli Site. The artesian conditions in the bedrock are an indication of an upward flow direction in the alluvial aquifer may be occurring in small or localized areas, but such conditions do not necessarily represent what may be occurring across the entire Tonolli Site. EPA noted the presence of downward gradients in wells 11 and 12 which show the highest levels of groundwater contamination." This information is contained within the Administrative Record for the Tonolli Site.

EPA determined that groundwater cleanup action is required due to the presence of contaminants at elevated levels in the shallow overburden aquifer. Such action is required to prevent the migration of contaminants to the bedrock aquifer, which serves as a current or potential future source of drinking water for several thousand residents in the Site area. The contaminants found to be present in Site groundwater do not appear to have impacted the water quality in the local water authority's supply wells. However, since potential future pumping of the bedrock aquifer may alter the hydraulic characteristics (i.e., natural upward gradient/artesian effects) in the immediate Site area, EPA determined that groundwater cleanup action is further justified. Reducing the levels of contaminants present in the shallow overburden aquifer will insure the protection of the local authority's water supply.

While the RI/FS data provided some evidence that the bedrock's artesian characteristics may prevent the downward migration of contaminants, EPA did not consider this to be conclusive. In addition, the RI/FS did not include sufficient data or documentation to support the contention that, even if migration were to occur at the Site, the contaminants would be naturally attenuated within the subsurface environment. EPA determined that cleanup of the Site groundwater is necessary to insure that the remedial action is sufficiently protective of human health for both current and future scenarios.

44. One commentor stated that the Proposed Plan suggests deep groundwater contamination is present in the bedrock aquifer, and that the Proposed Plan incorrectly implies that there is a state requirement to remediate groundwater to background quality. This commentor also contends that the approach to groundwater remediation is inappropriate and/or unnecessary.

EPA RESPONSE: The Proposed Plan should have clarified that the contamination was found in both shallow and deep monitoring wells constructed within the overburden alluvial aquifer. This information, however, is included in the ROD as well as the RI/FS Reports and the Administrative Record for the Site.

The Commonwealth of Pennsylvania has asserted an ARAR for this Site requiring that all groundwater must be remediated to "background" quality. The specific citations for this ARAR include 25 PA Code 264.90 -264.100, and in particular, 25 PA Code 264.97(i),(j), and 264.100(a)(9). EPA has recognized this as an applicable requirement for the remedial action at Tonolli, and included it as such in the Proposed Plan.

As described earlier, EPA has determined that groundwater action is necessary to insure the protection of human health, and to comply with ARARs identified for this Site. EPA disagrees that the use of pH injection as part of the groundwater remedial action for the Site is inappropriate or unnecessary. The primary purpose of this pH injection activity is to increase the flow of groundwater through the chemical barrier. This technique could serve to increase the overall effectiveness of the groundwater action by reducing the time for cleanup. The use of pH injection will be fully evaluated during the remedial design.

Risk Assessment and Cleanup Level

45. One commentor stated that the human health risk assessment for the Tonolli Site considerably overestimates risks associated with exposure to lead due to the improper calibration and application of the IU/BK model to the Site. The commentor also stated that the Tonolli Site Risk Assessment utilized the Society for Environmental Geochemistry and Health (SEGH) model which is not appropriate for predicting adult lead health effects.

EPA RESPONSE: EPA disagrees that the human health risk assessment for the Tonolli Site considerably overestimates risks associated with exposure to lead. EPA believes that the Human Health and Ecological Assessment (Baseline Risk Assessment) completed for this Site evaluates potential health risks, and specifically lead risks, in accordance with current Agency guidance and policy.

The Baseline Risk Assessment completed for this Site properly used the Integrated Uptake/Biokinetic Model (IU/BK) to evaluate lead risks, since this model represents the only viable mode for assessing lead toxicity in a potentially exposed population. The IU/BK model is also the sole method available to EPA for establishing tangible cleanup levels for lead in soils at Superfund sites. The IU/BK model was calibrated in the Baseline Risk Assessment to the extent that Site-specific data were available. In these instances, the default parameters appearing in the model were replaced with actual data to more accurately reflect Site conditions. The default exposure parameters inherent to the IU/BK model are representative of best estimates, not upper bound values. Therefore, the assertion that risks predicted by the IU/BK model are exceeded only under a worst-case exposure scenario is unfounded.

In addition, EPA agrees that the SEGH model, in its current form, contains many serious flaws, and is inappropriate for evaluating lead exposure in adults. For this reason, the SEGH model results were not used to establish a cleanup standard for lead in soil at the Site.

46. One commentor stated that the soil cleanup level selected in the Proposed Plan for Tonolli is overly conservative and does not comply with existing EPA policy and directives on lead site cleanups. Such policy(ies) allows for lead cleanup levels above 1000 ppm to be selected by EPA on a site-specific basis. The commentor contends that a soil lead cleanup level considerably above 1000 ppm will achieve EPA's objectives for protecting human health.

EPA RESPONSE: EPA disagrees. EPA believes that 1000 ppm, the upper bound of the range of values cited by Agency guidance as protective of individuals exposed to lead in a residential setting (500-1000 ppm), is a proper, albeit conservative, cleanup standard to use at this Site. This cleanup standard or level was developed based on the results of the IU/BK model, and EPA's knowledge of the most probable future use of the Site by adult workers. EPA did not consider it appropriate to select a cleanup level for lead in soils outside of the 500 - 1000 ppm range for this Site. Based on EPA's judgement of the site-specific conditions, and the Agency's current knowledge of the health effects associated with lead exposure to adults, the 1000 ppm cleanup level was selected to represent what EPA believes will be protective of human health and the environment for this Site.

The approach EPA used in selecting a soil lead cleanup level is in accordance with current Agency guidance and policy for lead sites. EPA's current guidance (OSWER Directive 9355.4-08, 24 March 1992) recommends the use of the IU/BK model for establishing cleanup levels for lead in soil at sites where current or future land use is characterized as residential. Presently, a recognized method for assessing lead exposure in adults does not exist. Therefore, EPA used the best available method and most scientifically valid approach (IU/BK model) for assessing lead toxicity in a potentially exposed population. Using the IU/BK model results as a baseline, and introducing a degree of flexibility to account for the different exposure scenarios (i.e., adult workers versus child residents) that are expected for the Site, EPA determined that a soil lead cleanup level of 1000 ppm was appropriate for Tonolli. Because adult workers will continue to be on the Site, EPA has determined that the use of the 1000 ppm cleanup level will be protective of human health at the Site.

47. One commentor stated that EPA has failed to develop central tendency figures to use in conjunction with reasonable maximum exposure (RME) figures when completing human health and risk assessments for Superfund Sites.

EPA RESPONSE: EPA's guidance requiring the inclusion of central tendency estimates in quantitative risk assessments was issued on February 26, 1992. The draft Risk Assessment for the Tonolli Site was submitted to EPA for review on January 4, 1992. Since the draft Risk Assessment was generated and submitted prior to the issuance of the foregoing guidance, central tendency estimates were not included for the Tonolli Site Risk Assessment.

48. One commentor stated a strong objection to EPA's method for arriving at the 1000 ppm cleanup level for lead in soils at the Site. The specific objections included: (1) the Proposed Plan and Administrative Record do not contain adequate substantiation of the choice; (2) under applicable principles of administrative law, reliance on a guidance policy cannot sustain the decision; and (3) EPA's use of the IU/BK model does not appear in the Plan or in the Administrative Record for Tonolli.

EPA **RESPONSE:** As required by the NCP, the Proposed Plan summarizes the information relied upon to select the preferred alternative. Such a summary does not provide the level of detail needed to fully substantiate each choice or preference indicated within the context of a proposed plan. The Administrative Record includes significantly more detailed information which does serve to adequately substantiate EPA's selection of an acceptable cleanup level for lead in soils for Tonolli.

EPA used the best technical information available in determining a cleanup level that EPA believes will be protective of human health and the environment. The IU/BK model is presently the only viable mode for assessing lead toxicity in a potentially exposed population, and is also the sole method available to EPA for establishing tangible cleanup levels for lead in soils at Superfund sites. At present, there is no recognized method or Agency-approved technical guidance for assessing lead exposure in adults. Therefore, EPA used the best available approach for determining an appropriate cleanup level for lead in soils. EPA did review and consider other available information that was included in the Risk Assessment Report for Tonolli, such as the Society for Environmental Geochemistry and Health (SEGH) model. However, since EPA believes that this SEGH model contains many serious flaws in its current form, EPA does not consider the model appropriate for evaluating lead exposure in adults.

EPA's Preferred Alternative

49. Several comments were received indicating that the preferred remedy described in EPA's Proposed Plan is not cost-effective, and that other alternatives could be selected since they appear to offer equivalent protection, are more cost-effective, and provide a better balance among the evaluation criteria set forth in the NCP.

EPA RESPONSE: EPA believes that the preferred remedy (Alt. 6), as it was originally described in the Proposed Plan was a cost-effective remedy. This remedy offered a high degree of long-term effectiveness and permanence, while incorporating the use of permanent solutions and alternate treatment technologies to the maximum extent practicable.

Based on new information and extensive comments submitted to EPA during the public comment period, EPA has modified the selected remedy in the ROD to include an alternate approach to the treatment of contaminated soils. EPA has not selected a different remedial alternative, but has modified the scope and nature of the soils treatment component of the preferred alternative (Alternative 6). EPA determined, upon evaluation of the new information, that the alternate approach will meet EPA's remedial action objectives and health-based cleanup levels for the Site, and will do so in a more cost-effective manner. This modified remedy is discussed in detail in Sections IX, X, and XI of the ROD.

50. One commentor stated that the ROD should clarify the goals of implementing stormwater treatment as part of the remedial action at the Site, and should specifically state when it will be appropriate to terminate the activity.

EPA RESPONSE: Section IX of the Record of Decision provides a description of the goals and performance standards for the operation of the stormwater treatment component of the remedy selected for Tonolli.

51. One commentor stated that EPA failed to provide the public

with any explanation of how the cost-effectiveness determination in the Proposed Plan was reached. This commentor also asserted that the Administrative Record for Tonolli includes documents indicating that the treatment of soils, as required by the preferred remedy in the Proposed Plan, is unnecessary.

EPA RESPONSE: As required by the NCP, the Proposed Plan summarizes the information relied upon to select the preferred alternative and need not provide the level of detail needed to fully substantiate each determination described therein. The Administrative Record serves to support the findings and determinations that are summarized in a proposed plan. The Administrative Record also includes all relevant information that was considered and evaluated by EPA during the Feasibility Study process and the screening of remedial alternatives using the nine criteria in the NCP, including comments submitted by peer reviewers such as the State, other federal agencies, and EPA's oversight contractor. The ROD serves to document EPA's final determination of the selected remedy.

52. One commentor stated that the Administrative Record does not demonstrate that the contamination found to the immediate west of the Site in a residential property was caused by the Tonolli operation. The commentor also stated that the ROD should not require cleanup of materials which are not Site related.

EPA RESPONSE: The Administrative Record for Tonolli includes sufficient information supporting EPA's position that the contamination found in soils to the immediate west of the Site boundary may be attributed to Tonolli's operation. In EPA's January 21, 1992 correspondence accepting the final RI Report for the Site, EPA indicated that this issue had not been resolved to our satisfaction, and that this area west of the Site entrance would continue to be included in the evaluation of the Site, and the potential health risks posed by the presence of contaminants. In additional correspondence dated February 26, 1992, wherein EPA accepted the Risk Assessment for Tonolli, this matter was again listed as an outstanding issue. EPA's position was stated, as follows;

"It is EPA's position that the presence of elevated levels of lead in soils to the immediate west of the Tonolli Site boundary may be attributed to the wind dispersion of dust from Tonolli's operation. As stated in our letter dated 1/21/92, EPA is concerned that, due to the presence of residential dwellings at the southwest border of the Site, there may be unnecessary exposure to Site-related contamination in this area. Since the RA Report evaluated health risks for offsite residents (specifically for residents to the west), and considers this to be a complete exposure pathway (under the future scenario) EPA will make use of this and any additional information that may be collected in determining the appropriate cleanup for the Site and any offsite impacted areas."

The Administrative Record for Tonolli includes sufficient documentation of EPA's concerns and intentions with respect to the contamination found in soils in a residential area to the immediate west of the property boundary. Based on the results of the Risk Assessment, the level of lead in soils in this residential area poses a potential health risk to children. For this reason, further investigation and cleanup in this area has been included as a component of the selected remedy for the Site.